July 15, 1920 American Machinist Vol. 53, No. 3

Wickes Crankshaft Line-Bearing and Flange-Turning Lathe

By J. V. HUNTER
Western Editor, *American Machinist*

Production of automotive crankshafts in large quantities requires highly specialized machinery. Such machinery, embodying the ideas of many designers, has been built from time to time only to be superseded by some later design better adapted to the work—and the end is not yet.

WITH the idea that high-duty production requires an exceptionally rugged machine tool, Wickes Brothers, Saginaw, Mich., has developed a line of lathes especially adapted to turning the line bearings and flanges on automotive crankshafts. To obtain the highest quality and rate of production from machines of this class it is required that the tooling be designed by a specialist and consequently all these machines are built complete with the tooling for the jobs upon which they will be used.

These lathes are built only in one size of 20-in. swing. It is optional with the buyer whether they shall be of the belt-driven type as shown in Fig. 1, or furnished with motor drive, as shown in the cheek-turning lathe in Fig. 2.

The bed is of deep, heavy box-type construction and has a single V in front and a flat way on the back upon which the carriage rides. The tailstock is of heavy-duty standard construction and is carried on a separate set of ways of the same construction as those for the carriage.

The headstock is back-geared, the ratio being arranged to suit the job. The back-gear shaft is provided with ring oilers.

The spindle is made of 0.40 to 0.50 carbon steel with a collar on the work end forged integrally and all bearings are ground to size. It is equipped with ball-thrust bearings on the rear end. The cone pulley is bronze bushed and has three steps. A Hilliard multiple-disk type clutch is used for transmitting the power. The brake band is made in two parts and is lined with high-grade brake lining. The spindle bearings have sight-feed oilers. It will be noted that there are six spindle speeds, but as a double-speed countershaft always is furnished with the machine, twelve speeds are available.

The transmission between the main spindle and the quick-change gear-box is by spur gears. The gear-box has eight feeds, four from the quick-change box and four for an auxiliary box operated by a lever which controls a split-feed. The initial feeds are $\frac{1}{4}$, $\frac{1}{16}$, $\frac{3}{32}$ and $\frac{3}{64}$ in. The split feed halves the difference be-

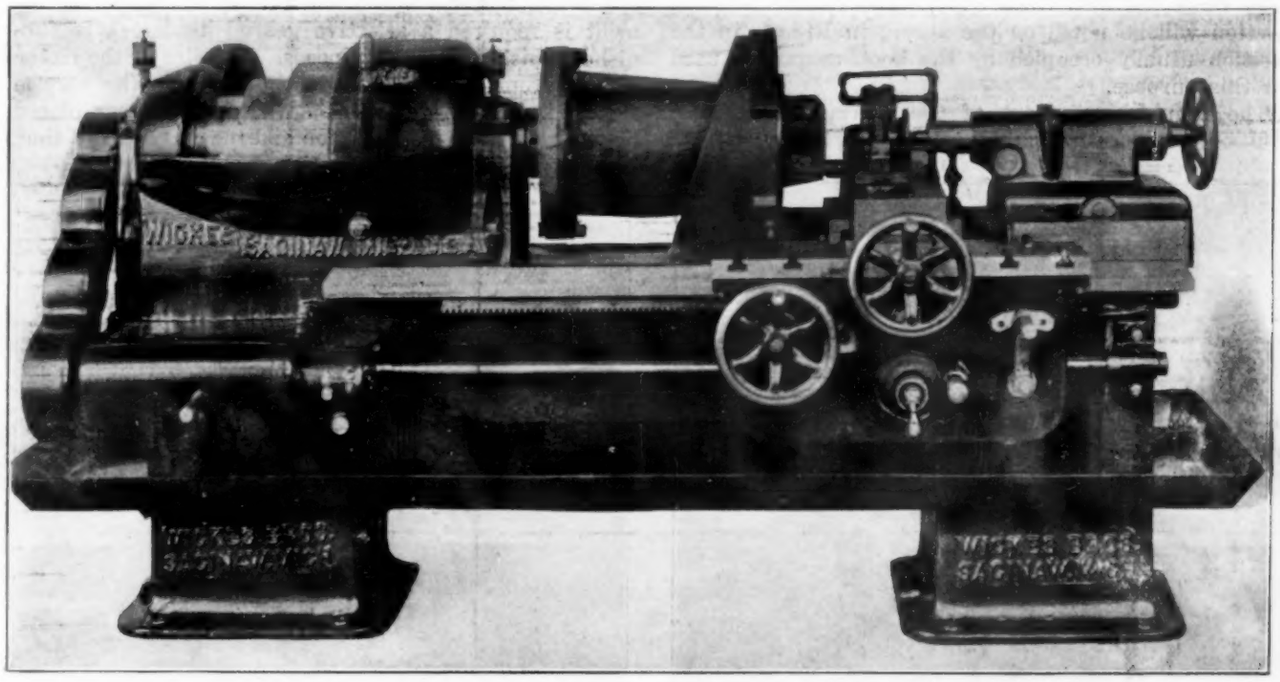


FIG. 1. WICKES BELT-DRIVEN CRANKSHAFT LINE-BEARING AND FLANGE-TURNING LATHE

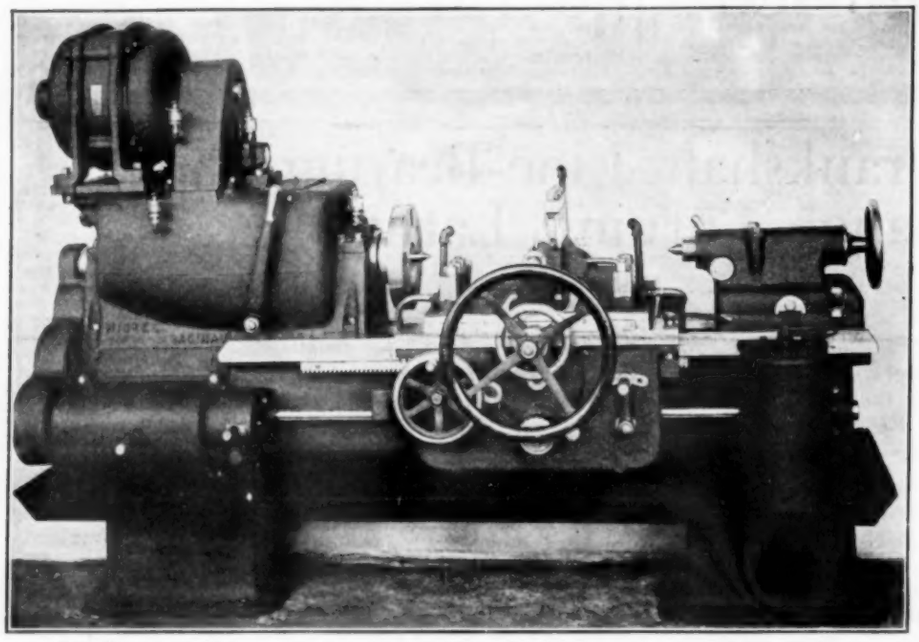


FIG. 2. MOTOR-DRIVEN CRANKSHAFT CHEEK-TURNING LATHE

tween the regular feeds, thus adding the additional four feeds of $\frac{3}{32}$, $\frac{3}{16}$, $\frac{3}{128}$ and $\frac{3}{256}$ in.

An advantage claimed for the split-feed arrangement is that the operator can start the machine at a slower feed for the larger diameter of work, on such as facing flanges, and as the diameter decreases he can throw in the split-feed in order to obtain a higher rate of feed for the decreasing diameter.

The carriage is of heavy construction for carrying the heavy tool loads imposed, and is taper gibbed both back and front.

The apron is provided with friction-drive for both longitudinal and cross feeds. The frictions are engaged by a device allowing quick action and ease of adjustment. It may be controlled with either hand or by the knee when the hands are busy. The handle for this friction will be noted on the apron, in Fig. 1, in the position usually occupied by the knob commonly used for this purpose.

The regular equipment of the carriage includes a double tool block which is held down by taper gibs and provided with additional gibs on each side at the rear to take the upward thrust of the back tools. Cast-steel multiple or single toolholders, shown in Fig. 3, are provided, the design of which admits of supporting the tools close to the cutting point, thus insuring a minimum overhang. The toolholder bolts go clear through into the tool-block, insuring rigidity. The toolholder clamp is used as a carrier for feeding the coolant to the cutting point of the tool. In Fig. 4 it will be noted that the coolant pipe *A* is tapped directly into the toolholder clamp *B*. The latter is drilled through lengthwise, the hole connecting with that tapped for the pipe. The coolant is delivered at *C* and flows over the cutting edge of the tool.

A pot-chuck is provided to support the work rigidly and prevent chattering. Its use also avoids the necessity of turning a spot on the work for a steadyrest. The pot-chuck is so designed that the crankshaft is supported close to the point where the work is done, thus minimizing a tendency of the work to twist.

The pot-chuck is of cast steel and is supported by a steadyrest at the outboard end. The bronze shoes of the steadyrest are wide enough to overspan the slot cast in the top of the pot-chuck to permit ready placing and removal of the crankshafts. Each pot-chuck is designed especially for a particular crankshaft.

As previously mentioned, the lathe can be furnished either belt or motor driven. The latter type of drive uses either a multi-speed a.c. motor, or a variable-speed d.c. motor. When constant-speed motor equipment is required a selective geared headstock is furnished which provides 12 speeds. The size of the motor ranges from 3½ to 5 hp., depending upon the service required. The drive is through a rawhide gear placed between the steel motor pinion and the driven gear, thus insuring quietness of operation.

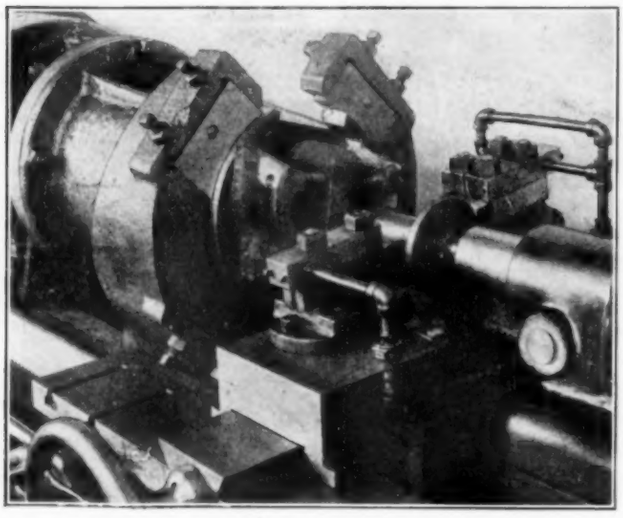


FIG. 3. SHOWING POT-CHUCK AND TOOL EQUIPMENT

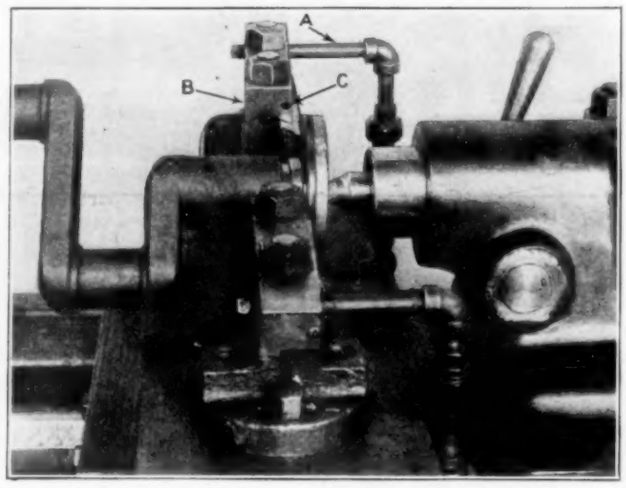


FIG. 4. TOOLING FOR FLANGE TURNING

How Do You Regulate Materials?—II

By HENRY H. FARQUHAR

The functions with which the present paper deals center in the receiving and storing of materials after they come into our posession. The authority by which they come in is, of course, the purchase order, and no goods must be received except upon this authority.

(Part I was published in our June 24 issue.)

The Receipt, Storage and Records

THE preceding article in this series dealt with some of the more important considerations in the regulation of supply, outlining certain principles and rules by which one may secure a constant and almost automatic flow of suitable articles to the point of use. Five planks of the material platform were laid down, the gist of the five being: (1) Centralization of authority and responsibility, and (2) regulation of replenishment according to use rather than the whims of individuals or other accidental factors. From these principles there were formulated five rules:

I. Replenishment of materials should be governed strictly by requirements for production during a reasonable future period.

II. There must be predetermined specifications for each article purchased.

III. All replenishment orders shall be in writing and may be issued only by specified persons.

IV. All replenishment orders shall be approved before they may be honored by the purchasing agent.

V. All purchase orders shall be in writing and must be systematically followed up.

The guiding principle in the receipt and storage of material is unified authority and responsibility; hence the following most obviously successful rule may be formulated:

VI. All Persons Concerned Directly in the Transaction Shall Receive a Copy of the Purchase Order

By following this rule we obtain an effectual check against material being dumped on us which we did not order and do not want. We also make collusion more difficult and establish checks against forgetfulness, against useless inquiries as to when orders were placed, against delivery to the wrong person or place, and so on.

Although it is bad practice, this step is sometimes omitted even in the case of the receiving clerk. Much additional and unnecessary work is thereby thrown upon him in checking up when materials arrive.

Opinions differ as to whether the receiving clerk should be told how much of any item is expected, or whether he should (by means of a short carbon) be informed simply that goods of a certain kind are due from a certain dealer. Each method has its advantages and disadvantages, and the matter is not ordinarily one of great importance. If sufficient checks against carelessness and dishonesty be instituted, there is no objection in practice to telling the receiving clerk exactly how many parts are expected, and his work is considerably expedited.

As a check on the actual execution of orders placed a second rule for control of material once purchased logically follows:

VII. There Must Be a Careful Count and Inspection of All Goods Received Before They May Be Stored or Released for Use

Some very surprising occurrences sometimes take place within the walls of a factory. One would think from the very nature of the case that materials would be considered of a value at least equal to their value in money. Such, however, is seldom the case. If you will analyze the subject carefully, I believe you cannot escape the conclusion that materials are very much more important than an equivalent sum of money. They should be as carefully looked after, and the modern material system should resemble the modern banking system to a large extent.

It is folly therefore to do as one manufacturer of my acquaintance did up to a short time ago. He had worked up excellent specifications, but under existing receiving methods he might as well have saved himself this expense, for when goods arrived he allowed them to go to the storeroom in blissful faith that the dealer had done exactly as he was expected to do. The awakening was sad but salutary.

A safe rule to follow in inspecting is to put as much care into the inspection as was put into the specifications. This means that in some cases a count is all that is necessary, while in others a very careful analysis must be made. Rejects should be immediately disposed of and cleared out of the way.

To connect the effects of this rule with those of the preceding one and check receipts against the outstanding copies of the order a wise rule is:

VIII. Notice of Receipt of Materials Shall Be Given Immediately

A case occurred recently in which a purchase order was sent out in a great hurry, with instructions to "rush delivery." The materials, it was found later, came in as ordered; but only after a week's delay and after insistence of the dealer that he had shipped the order, were the goods finally located in a corner of the receiving room. Production had meanwhile

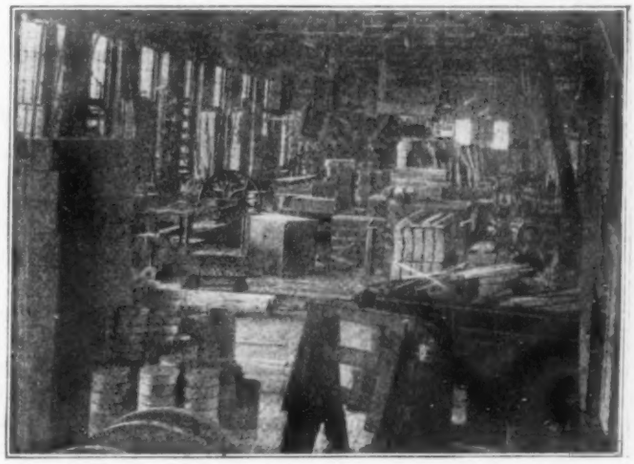


FIG. 3. WORKING SPACE USED FOR STORAGE IN VIOLATION OF RULE X

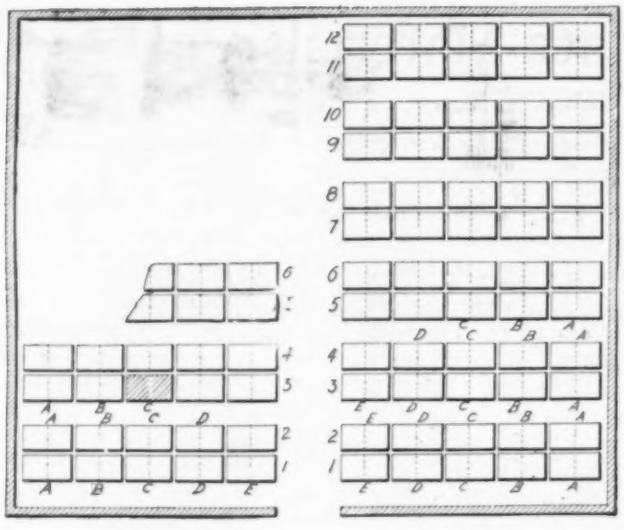


FIG. 4. METHOD OF INDEXING RACKS AND BINS

been held up. Since in the balance sheet is centered all information as to the state of materials, to the balance clerk immediately upon receipt must be sent a notification of arrival. The same notice may then serve the purchasing agent and the auditor.

Looking next at the question of storage, it must be clear that on the adequacy of the administrative and physical arrangements in this respect depends the effectiveness in practice of all preceding rules. The storeroom, to a greater extent than many realize, determines the accuracy with which we may govern materials, and as a consequence several important rules may be issued for its regulation:

IX. Responsibility for Storage and Issue Must Be Centralized

The mistake is often made in the medium-sized plant of failing to centralize storeroom responsibility, under the assumption that because we must have de-centralized storage we must therefore have de-centralized responsibility. Personally, I advocate the central storeroom where it seems at all practicable (among other reasons because it tends to force anticipation of needs) but many cases occur where it is out of the question. In such cases, however, there may and should be central responsibility for receipt, for storage, for issue, and for the regulation of policy and procedure.

X. Storage Other Than in the Storerooms Should Be Reduced to a Minimum

Upward of 55,000 lb. of scrap metal, the catch of a thorough housecleaning, was sold from one department of a New England machine shop. It was unearthed from around machines, under benches, in the aisles and corners, and consisted of both raw materials and partly worked parts which had become permanently sidetracked. The policy until that time had been to let the foreman arbitrate between the sales manager and the other production foremen of the plant as to when any given job should be processed. As a result, jobs were frequently broken down to please one or another of these officials, and the work thenceforth became neglected. Were not this an actual and a recent case, it would appear too ridiculous to cite. It is not an uncommon policy even today, as may be seen in Fig. 3.

Another potent cause of loss in many plants is the policy in handling departmental supplies. It is always a little difficult to draw the line as between what may be held in the shop, and what must be stored in and issued from the storeroom. In general, however, it may be accepted that when a job in process is interrupted for what will probably be more than a few hours, all parts in process should be turned over to the storeroom accompanied by proper notations of the fact; and that departmental supplies (such as bolts, screws, etc.) should be issued to the work place and charged off at once to the proper expense account in quantities sufficient to last only a few days, the main source of supply remaining under the custody of the storekeeper and controlled through the regular routine.

XI. The Storerooms Must Be Accessible Only to Authorized Persons

The success with which so many plant activities may be controlled hinges at many points on the accuracy of the inventory. Consequences have at times been very distressing when we thought we had 100 pieces on hand when there were actually only 85. Our accounting statements furthermore are misleading unless our inventories of materials and work in process be correct. Primarily, in order that we may maintain any semblance of control, therefore, and only secondarily because some among us have the habit of pocketing what does not belong to us, we must have a locked storeroom. The psychological effect furthermore is excellent. I told one manager the other day: "You have no more right in this storeroom without permission of the storekeeper than the humblest workman." The strange part of this story is the fact that he smiled and agreed with me.

XII. Materials Shall Be Stored and Indexed According to a Systematic Scheme

It is not an uncommon occurrence in many storerooms to be put to considerable inconvenience and delay simply because a needed article cannot be quickly located. The knowledge of the whereabouts of any item should not be confined to any one's head, for heads are sometimes unavoidably lost in times of greatest need.

Where a good system of stores and worked materials

Courtesy Universal Winding Co.

FIG. 5. RACKS WITH INTERCHANGEABLE STORAGE UNITS

symbols is in use, the most satisfactory method of storage by all means is alphabetically by symbol. With standard interchangeable racks and bins such arrangement, particularly in the metal-working storeroom, is easily maintained, and aside from the symbols which should be on each bin, no other indexing system is ordinarily needed. Such a systematic arrangement by symbol is not always possible for all items, however, and in such cases, or where such symbols are not in use, the rows of racks, the individual racks themselves, and the separate bins within each rack must be numbered and lettered according to a definite plan, with a cross index to show just where each item is to be found.

Fig. 4 illustrates a satisfactory method of indexing storage racks and bins in accordance with Rule XII. The method here followed is similar to that used in numbering houses in a city. The shaded area represents plan of one standard rack four stories high, into each compartment of which fit interchangeable bins (see Fig. 5) of suitable dimensions. The complete rack is designated B 3 C, and the location of an article in a bin in the second story from the bottom would be B 3 C 2.

Where materials may be stored according to symbol, such a method of indexing is of course unnecessary.

XIII. Movable, Interchangeable Storage Units Should Be Used as Far as Possible

Continual rearrangements, particularly in individual racks and bins where other than bulk goods are stored, but also frequently in the whole layout, are desirable in most storerooms. All equipment, therefore, should lend itself readily to such changes. Racks and bins should very seldom be built-in, and they should, so far as possible, be absolutely interchangeable. Standard bins of various appropriate sizes should fit interchangeably into any racks throughout the storeroom, so that, with the expanding and contracting requirements of different articles, an easy rearrangement will prevent "over-flow" bins, keep all of any one item together, and provide maximum space utilization.

Somewhat akin to this subject is that of attention to labor-saving devices in general—a subject which will repay much time and investment. There are many little wrinkles and facilities which may be utilized in counting, storing, and especially in transporting materials, and which in the aggregate will save many hours' work in the average storeroom.

XIV. Double Binning Should Be Used Wherever Possible

Double binning, by which one bin is used for all incoming material of any kind and its brother for all issuing, the process being reversed when the latter becomes empty, serves many uses in connection with material control which can be only hinted at. For instance, I have seen iron washers dumped from the bottom of a bin so rusted and caked together as to be almost unrecognizable. They had lain there for months undisturbed during the putting in and taking out of those above them.

Double binning would have aided materially in preventing such occurrences. It would, moreover, have furnished incidentally numerous checks on amount in keeping perpetual inventory. Fortunately, double binning, or double piling, adds on the average probably not over 33 per cent to the amount of space required over single bins or single piles. This additional space may ordinarily be provided in the average storeroom through attention to a more effective arrangement and a better space utilization. Double binning may be seen in the rack in Fig. 5.

Courtesy Universal Winding Co.

FIG. 6. RACK FOR BARS AND PLATES (NOTE METHOD OF DESIGNATING INDIVIDUAL BINS)

Finally, all transactions in materials must be covered by adequate records. The more important records covering replenishment were touched upon in the preceding paper, and, as there explained, the balance sheet constitutes the running history of most of the transactions which it is necessary to have covering materials. In order that this history may continuously serve the needs of production, two rules should be enforced:

XV. A Perpetual Inventory Should Be Maintained on all Goods

Periodic inventories (annual, semi-annual, quarterly) are fortunately rapidly becoming things of the past. Modern business cannot wait for periodic stock-taking —the information of amounts on hand must be available constantly and immediately for day-to-day planning and accounting.

I do not propose to go into a discussion of the merits of the perpetual inventory and the demerits of any other kind, but I simply wish to say that the manufacturing industry is yet to be found where the perpetual inventory is not perfectly applicable, more accurate, cheaper, and of infinitely greater utility than is the periodic. It is simple to install, easy to operate, and, with proper checks, accurate even beyond practical requirements.

XVI. Balances of Materials Must Be Kept on Bin Tags and on Balance Sheets, With Constant Independent Checks Between Them

Neither the bin tag nor the balance sheet alone is sufficient—one is a complement to the other and should be so used.

In one case which I recently had the pleasure of looking into, the manager rather prided himself on his "stores system." "Just see," he said, "we have our balances on hand for each item, kept on cards in the storekeeper's office. All he has to do is to make the proper entry on the proper card after receiving or issuing, then the stores issue slips go right up to my office where the balance clerk makes a corresponding entry on the balance sheet. There is not much chance for any mistake, because we get a double check." As a matter of fact, individual amounts as shown in the bin, the storekeeper's card, and the balance sheet varied on different articles all the way from 0 to 700 per cent.

The final result of a careful round-up of all items showed actual figures as follows:

	Units
Gross amount as per balance sheets, approximately	100,000
Gross amount as per storekeeper's records, approximately	45,000
Gross amount as per bins (actual count)	48,000
Apparent loss in units, nearly	55,000
Apparent loss in money, nearly	$15,000

There was, moreover, a tremendous surplus above any reasonable future needs on some articles, while the balance on others was dangerously low.

An analysis of the causes of this state of affairs revealed that:

(1) The storeroom was not locked.

(2) Responsibilities for receiving, storing, issuing and record-keeping were scattered among several persons.

(3) Tags were kept at the desk instead of at the bin or pile. This resulted in delayed, and then hurried or neglected entries; entries on wrong cards; entries of wrong amounts in cases where amount originally called for could not be issued, and the stores issue was not accordingly changed; and a lack of the quick and easy check as between bin contents and tag balance which is possible only when they are together.

(4) The issuing of goods on verbal requests.

(5) The absence of a properly conducted perpetual inventory.

(6) The absence of automatic continuous checks with the balance sheets.

The sins in this case were nearly all those of omission. By instituting the missing features, at no additional clerical expense (because of concentration in work and more logical routine), a satisfactory perpetual inventory was put into effect which checked with a later (the last complete) physical inventory within a fraction of one per cent.

A consideration of these eleven rules will, I trust, leave no doubt that careful attention to the receipt, inspection, and adequate safeguarding and recording of materials is of quite as great importance as is the strict regulation of their replenishment. The third phase of material administration—the issue, classification and organization—will be discussed in a succeeding paper.

Chamber of Commerce of the United States Votes on Elimination of Strikes by Public Service Employees

Organization members of the Chamber of Commerce of the United States were asked today to vote on two recommendations submitted by the Chamber's Committee on Public Utilities. Those recommendations are that:

1. Strikes by employees of all public service corporations, performing public service essential to the lives, health, well-being and comfort of the people should be explicitly prohibited by law.

2. Suitable tribunals should be created by the law to adjudicate differences between employees of public service corporations and their employers, and decisions of such tribunals should be final and binding upon both parties.

The subject came before the Chamber from the Merchants' Association of New York, and the presidents of the principal business organizations of New York City. The communication, dated April 19, said in part:

"For several weeks past the economic and social life of this nation has been crippled, and in part paralyzed, by the enforced cessation of the function of transportation.

"Whatever may be said regarding the rights of the employees in ordinary industrial operation, we are strongly of the conviction that the arbitrary cessation of labor by the employees of public utilities is a wrongful attack on the rights of the entire people, and that such arbitrary cessation should be made impossible by the enactment of proper restrictive laws.

"The undersigned chief executive officials of the principal business organizations of the City of New York, respectfully request that the Chamber of Commerce of the United States give immediate consideration to this subject with a view to formulating and declaring the rights of the public, and to promoting legislation suitable to protect the public, and to prevent further destructive invasion of its rights."

The communication was signed by Alfred E. Marling, president of the Chamber of Commerce of the State of New York; William Fellows Morgan, president, and Lewis E. Pierson, vice president of the Merchants Association; J. Sherlock Davis, president of the Brooklyn Chamber of Commerce; H. Pushae Williams, president of the Chamber of Commerce of Queens, and James Breckenridge, president of the Bronx Board of Trade.

In recommending the proposals for a referendum, the chamber's Committee on Public Utilities expressed its belief in the following set of principles.

"No corporation or person, individually or collectively, may lawfully or rightfully obstruct or impede the performance of any duty or obligation of the State or of any agency created by the state for the performance of a public service.

"The state is sovereign. Its will is expressed through the Government created by it. That will cannot be given effect if the servants of the Government refuse to obey its behests. Therefore, no servant of the Government has either moral or legal right to obstruct the lawful processes of the Government. If such assumed right were successfully asserted, the will of the servant would over-ride the will of the people, the Government would be subverted and the servants would become the masters. It is the obligation of the State to protect the lives, health, security, rights and property of all its people.

"These depend upon the uninterrupted operation of the agencies which provide transportation, water, light, heat, power, and means of communication. It is therefore the right of the people that such uninterrupted operation be guaranteed by the power of the state.

"These agencies are created by the state for the performance of services of a public character; they are devoted exclusively to the service of the public; they operate by virtue of public powers delegated to them by the state; and they are thereby public agencies by the state to perform public services indispensable to the well-being, comfort, security, and often to the health and lives of all the people. The state is, therefore, bound so to exert its powers as to enable these agencies and instrumentalities fully and effectively to perform the public purposes which have been delegated to them.

"The immediate result of a strike is to compel the suspension of the industry against which the strike is directed. When directed against a public utility it is an invasion of that which is indispensable to the community.

"The effect of a strike against a public utility is to inflict great harm upon the community. It often entails widespread suffering, seriously endangers the public health, deprives large populations of a sufficiency of food, fuel and other necessities of life. It deprives the people of the instrumentality of commerce, thereby causing widespread suspension of industry, and taking from many the means of livelihood; and in many ways inflicts great distress upon all.

We believe it is the duty of the state, by suitable legislation to protect the people against these dire consequences. Strikes by employees of public service corporations should be prohibited by law as conspiracies against the paramount rights of the public. It is obvious, however, that the great class of employees thus deprived of the power of self-protection by means of the strike should be otherwise protected against unjust relations with their employers through suitable tribunals empowered equitably to adjust differences, whose findings should be final, and supported by due provision for enforcement.

"The recently pending Cummins bill, regulating railroad transportation, contained a provision (adopted by the Senate, but discarded by the House) which made it unlawful for any two or more persons, being employed by any common carrier or carriers, 'to enter into any combination or agreement with the intent substantially to hinder, restrain or prevent the operation of trains or other facilities of transportation for the movement of commodities, or persons in interstate commerce, or, in pursuance of any such combination or agreement and with like purpose, substantially to hinder, restrain or prevent the operation of trains or other facilities of transportation,' etc., under penalty of a fine of $500 or six months' imprisonment, or both. A similar inhibition was laid against aiding, abbetting or procuring such interference. The Cummins bill also contained a provision whereby the employers were protected against imposition of unjust conditions of labor.

"The purpose of these provisions was to prevent the interruption of service by strikes and compel resort by both parties to settlement by the legal boards proposed for that purpose.

"We believe that these, or similar provisions should be made law, not only as to railroads, but as to all public utilities."

Acme Screw Threads

BY A. J. SCHWARTZ

In the January, 1895, issues of the *American Machinist* A. M. Powell, A. W. Handy and others claimed what is now known as (christened by Mr. Handy, Jan. 3, 1895) the Acme thread. As stated at that time this style of thread was designed to overcome the faults of the square thread used principally in lead screws and in the nuts for these screws.

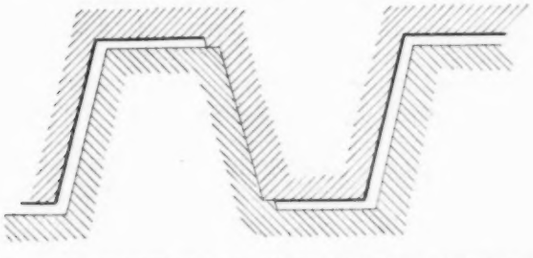


FIG. 1. CLEARANCE WILL NOT PROVIDE FOR TAKING UP LOST MOTION

The clearance of 0.02 in. between the major and minor diameters of the screw and the nut, it was claimed, was allowed so that it would permit taking up lost motion; but, as was indicated in the *American Machinist* Mar. 28, 1895, by John A. McGregor and as shown in Fig. 1, this could not compensate for wear. The Acme thread was not designed for any particular ratio of pitch for a given diameter although W. S. Dix, in your paper of Mar. 28, 1895, recommended that the ratios of pitch to diameter be in the proportion of one half the number of threads or twice the pitch of the U. S. standard screw. Mr. Powell and Mr. Handy

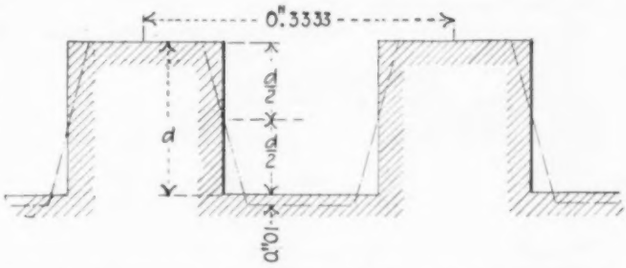


FIG. 2. HOW THE SQUARE THREAD WAS MODIFIED TO FORM THE ACME THREAD

showed how the square thread was modified (see Fig. 2) to form the Acme thread, and tabulated data was prepared accordingly. These tables giving the data for this style of thread have been handed down to this day and have been copied in engineering handbooks without any alteration.

No attention so far as I can ascertain has been made to the point so clearly stated by John A. McGregor in 1895, to the effect that the space or 0.02-in. clearance called for between the screw and nut was absolutely useless for taking up wear; and considering the rod or bolt it was, and is, a source of weakness in that this extra 0.02-in. reduction in diameter reduced the area of the bolt or rod unduly, thereby requiring a larger diameter of bolt than needed with a consequent increase in weight.

In these modern times interchangeability and accuracy in all kinds of screw threads are absolutely essential and the use of go and no-go gages, projecting lanterns or other accurate measuring instruments is of necessity a prerequisite and this brings me to the point that prompted me to write this little article in the hope that some information may be obtained through your valuable paper from engineers or others that have had any dealings with Acme threads. The gist of the matter in a few words is:

How much allowance should be permitted between the mating parts on the slope of the Acme thread for a loose and a tight fit and how much tolerance should be permitted?

I am seeking information but I give herewith in answer to this question a particular case where there was permitted an allowance of 0.005 in. between the slope of the mating parts on a three-pitch thread; that is, the pitch was 0.3333 in. The tolerances (not allowance) on the diameters were 0.005 in. in the nut and 0.005 in. on the rod. Taking the minimum nut as basic, which by the way is a good principle, 0.002 in. was called for between the maximum minor diameter on the shaft and the minimum minor diameter in the nut and

an allowance of 0.02 was called for in the nut over the maximum major diameter of the screw. This is clearly shown in Fig. 3. The dimensions on the nut are in accordance with tables for Acme threads as given in

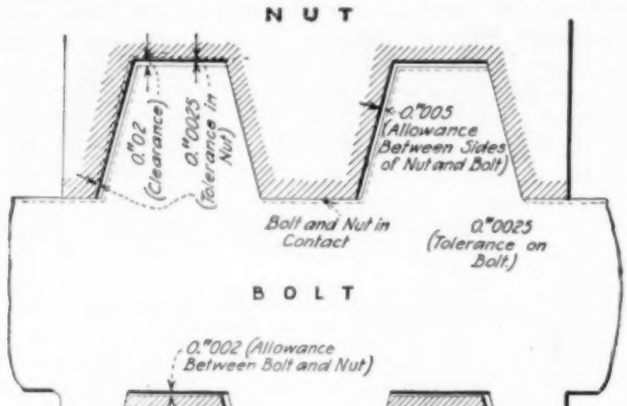


FIG. 3. ALLOWANCE BETWEEN MATING MEMBERS FOR TIGHT AND LOOSE FITS

the "American Machinist Handbook" with the exception of the 0.005-in. tolerance on the diameter.

Fig. 4 shows a nut and bolt drawn in accordance with the tables given in the handbooks and a study will show that the parts cannot go together as every touching surface of the bolt is the exact dimensions of its mating part in the nut; therefore, some allowance should be determined to permit the parts to assemble without seizing. A difference of 5 to 10 min. in the angle might also give good results, but a change in the angle for a fit other than tolerances is not recommended.

In conclusion it is earnestly hoped that some of our leading engineering societies such as the A. S. M. E.

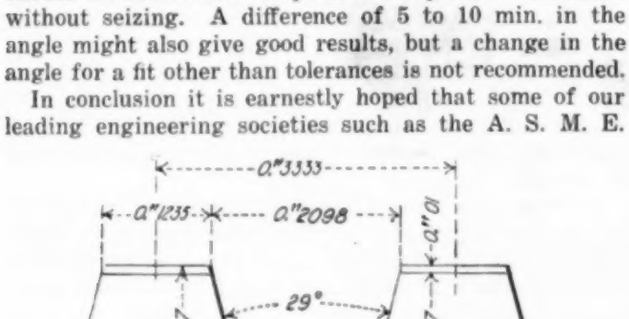


FIG. 4. NUT AND BOLT DRAWN IN ACCORDANCE WITH PUBLISHED TABLES

and the S. A. E. will establish a series of allowances and tolerances for this very practical kind of thread. The questions of the ratio of the thread to the diameter, minimum-hole basic, maximum-screw basic; the allowance per diameter for number of threads per inch and permissible error in lead per foot are questions that can be answered later; but, as I said before, let someone come forward and give data, if only for one pitch, for loose and tight fits between mating parts of Acme threads.

What Is a Machine Tool?

BY A. L. DE LEEUW

To give a definition of a subject is to express in words what we understand the subject to be, expressing it in such a way that everything which meets the definition should be included, and everything which does not meet the definition should be excluded. For instance, the definition of a circle is given in such a way that any figure that answers is really a circle, and any figure that does not entirely answer the definition would not be considered a circle by any intelligent being. This can be so because we ourselves are well agreed as to what a circle is, but when there is no agreement between ourselves as to the nature of the subject of discussion, then there is no possibility of a satisfactory definition. This is where the trouble lies with the definition of machine tools. It is not that we cannot express what we know, but that we are not agreed on the subject. If I should try to give a definition of a machine tool, I would do more than merely *define* the subject; I would really be laying down the law as to what the world must accept as machine tools.

However, I will give here a reasonable definition of *what I consider* to be a machine tool, permitting, of course, anybody or everybody to disagree with me:

> "A machine tool is a machine for the removal of material from a piece of work, and containing means for holding, guiding and controlling the work, or tool, or both."

According to this definition, a punch press is a machine tool; so is a woodworker's lathe or any other woodworking machine. For those who believe that machine tools should be confined to metal-working machinery, the definition might be modified thus:

> "A machine tool is a metal-working machine for the removal of material from a piece of work, and containing means for holding, guiding and controlling the work, or tool, or both."

This definition has the disadvantage that it would not include well-defined machine tools when they are used on materials other than metals, for instance, a gear-cutting machine ceases to be a machine tool when it cuts rawhide pinions. It might be said that the gear-cutting machine was intended as a metal-working machine, but I do not believe in embodying anybody's intentions in a definition which may have to be used later on for classification. In order to overcome this objection, the definition might be modified as follows:

> "A machine tool is a machine *capable* of removing metal from a piece of work, and containing means for holding, guiding and controlling the work, or tool, or both."

This again has a disadvantage, in so far that any woodworking lathe would be *capable* of removing metal from a piece of work. Personally, I do not think it necessary to distinguish between woodworking and metal-working machines, as they merge into each other, and for that reason I believe that the definition as originally given is the broadest and most nearly accurate.

In my opinion, a punch press or a shear is decidedly a machine tool. After all, I believe that a machine becomes a machine tool when it has a certain degree of refinement in the means of guiding tool and work, and that the question as to whether the metal is removed as chips or as punchings is not of much importance.

The Optical Flat - A Practical Measuring Tool

By H. L. VAN KEUREN
Consulting Mechanical Engineer, Boston, Mass.

When one has occasion to purchase a yard of cloth, he demands that the yard he pays for be somewhere near a yard, at least within one inch over or under a yard. In other words, the inch is a practical every-day unit for measuring a yard of common commodities. However, if the transaction involves a tract of land, say of 1,000 acres, an inch is of little consequence and the foot is therefore used as a convenient unit.

IN PRESENT-DAY production of machine parts, dimensions are specified in thousandths of an inch. Are these thousandths measured by a gage or micrometer accurate to only a thousandth of an inch? No, indeed, a finer unit must be used; namely, the ten-thousandth. So therefore, in the purchase of micrometers, gages, and other measuring tools, and, in fact, production tools, the accuracy is specified in ten-thousandths of an inch. But how is the maker of tools, micrometers and gages to determine his ten-thousandths of an inch? Necessarily, he must have a still finer unit. Today, as a result of the application of scientific principles (known in the science of Optics for many years) to a war necessity, an accomplishment of our National Bureau of Standards, the workman can take a most practical unit, the hundred-thousandth of an inch (0.00001 in.) out of the sky or from an electric light bulb. Furthermore, it is just as easy to subdivide this unit into tenths, thus securing the millionth of an inch (0.000001 in.), as it is to read tenths of a thousandth on an ordinary micrometer.

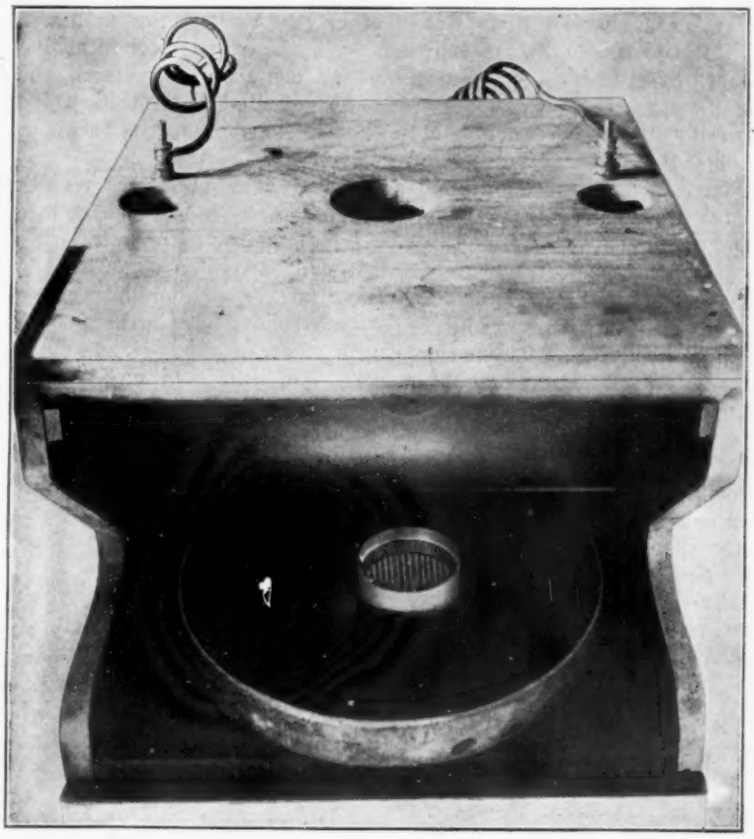


FIG. 1. VERIFYING THE FLATNESS OF AN OPTICAL FLAT TO MILLIONTHS OF AN INCH BY THE STRAIGHTNESS OF DARK INTERFERENCE BANDS, USING A MONOCHROMATIC LIGHT

To many, who have heard the recent discussion on "Millionths of an Inch" and "Measurement by the Interference of Light Waves," the whole subject seemed far fetched and too scientific to be adapted to real work. In fact, while the basic details are scientific, as is the case in any real development of the present age, the essential facts involved in the every-day use of this most recent development, the optical flat as a measuring tool, can be acquired in a very short time by any modern workman, and the advantages to be gained are of considerable practical importance.

Thus, deliberately and with the intention of explaining to the workman, the mechanic and the toolmaker, the every-day uses of light waves as a measuring unit, the relatively unimportant theoretical and mathematical phases of the subject have been eliminated in the following discussion. There have been included only the really important fundamental facts and the essential characteristics and meaning of interference bands in every-day measuring work.

What Is an Optical Flat?

Everyone is familiar with the magnifying glass. Good magnifiers and lenses are made of a clear white glass known as optical glass, and the surfaces are parts of spheres, accurately ground and polished. Now, the optical flat is really a special form of lens, known in optics as a plano lens. For measuring work only one commercial plano lens need be flat. Both sides should be polished, or clear, so as to be able to see through the flat. The side to be used is made very accurately flat. In fact, the ordinary commercial plano lens is not at all suited for measuring work. An optical flat, while it is a special form of lens, has, in the ordinary sense, no magnifying power; that is, it does not enlarge an object viewed through it. However, this simple tool, having a very accurate flat test-surface, enables us to detect with the eye the occurrence of errors or differences as small as one or two millionths of an inch.

Flatness Tests

One of the best ways to test the flatness of a lapped steel or other polished surface is with the optical flat. Not only can the exact nature of the surface being tested be seen at a glance but the test is very rapid, requiring only the time it takes to lay the flat on the surface being tested and to look at the condition revealed. The exact character of every part of the surface becomes known at once. Would you not like

to see, with your own eyes, the high points and the low points, for instance, on the anvil or spindle of your micrometer—or on the flat lapped parts of built-up fixtures, gages, precision blocks and the like? This is shown by the optical flat.

Referring directly to the matter of size blocks and precision gages, the optical flat is a necessity in their manufacture. Moreover, it furnishes the only available means for the purchaser to compare their actual accuracy with the specifications under which they were bought. It is also of equal importance to watch the effect of wear as regards flatness and size.

Length Measurements

The comparison of the length of a flat gage block or combination of gage blocks with a known standard is easily and most accurately made with the aid of two optical flats. Not only this, but at a glance it can be determined whether the surfaces of the two blocks are parallel, or how much they are out of parallel.

While the use of glass flats for optical measurements is most easily applicable for measuring lengths established by flat surfaces, it is possible to measure quite accurately the diameters of cylindrical plugs and balls.

Thus, knowing the nature of this new measuring tool and its important applications, the simple procedure of its use will be explained, first by calling attention to the essential fundamental facts regarding light, which furnishes the unit of measurement.

Light Is a Wave Motion

In moving along a straight path from one point to another, light travels in the form of a wave motion. These waves have a certain length, a certain height or amplitude, and travel at a given speed or velocity. Different colors of light have different wave lengths.

In ordinary measuring work we are concerned not with the amplitude or velocity, but with the length of the wave of the particular color of light used. These wave lengths are perfectly definite quantities which have been very accurately determined and which can be duplicated at any time anywhere in the world. They are therefore an ideal measuring unit.

The average wave lengths of the different colors of light are as follows:

Red	0.0000268	inch
Orange	0.0000248	"
Yellow	0.0000228	"
Green	0.0000208	"
Blue	0.0000189	"
Violet	0.0000169	"

Daylight

Daylight, which is sometimes known as white light, contains all of the colors and their wave lengths. The ordinary modern electric-light bulb gives off practically white light or the equal of daylight. As can be seen from the above, the average wave length for daylight is approximatly two one hundred-thousandths (0.000020 in.) or 20 millionths of an inch.

Monochromatic Light

Light which is composed of waves of only one length, or in which one particular wave length predominates, is known as monochromatic light or light of one color. Such a light is given off when a particle of common salt is held in a gas flame, in which case there results the yellow sodium light.

If a troop of soldiers marching across a bridge are in step the added effect of the vibrations or waves produced in the bridge by the timed blow of each man's foot may cause the bridge to vibrate dangerously, while if they are out of step the waves from the different men interfere or counteract each other and the bridge does not vibrate appreciable. Likewise, it is possible to have two light waves from a given source come together and be in step, thus causing a wave twice as big, or they may be out of step, thus counteracting or interfering with each other resulting in a mixture of light or no light (darkness).

Interference Between Glass Plates

When two pieces of nearly flat plate glass are placed together, care being taken to remove particles of dirt and dust so that the film of air between the plates is very thin, a series of colored interference fringes or bands are seen in daylight. These colored bands are due to the fact that the light reflected from one of the surfaces interferes with the light reflected from the other surface. An every-day example is cited in the colors which often occur after washing windows with water containing kerosene. The interference of the light reflected from the surface of the window with that reflected from the thin film of kerosene cause the colors.

Now, the interference resulting between two plates, when viewed in monochromatic light or light of one color, is a series of alternate light and dark spaces, rather than a series of colors as is the case with daylight. For simplicity, therefore, the explanations which follow will be made with reference to the use of a monochromatic light having a wave length 0.00002 in. The light and dark spaces resulting from interference with monochromatic light are known as interference fringes or bands. For our purpose the dark bands will be referred to in most cases. It is with these bands that we are concerned. They locate the occurrence of our unit of measurement, the hundred thousandth of an inch, and they tell the whole story.

Straight Bands Mean Flat Surface

In Fig. 1, which shows a source of monochromatic light, the operation of verifying the flatness of a 2-in. diameter optical flat is shown. The large bottom glass is an 8-in. master flat—one which has been previously tested by checking three surfaces together as is the procedure with ordinary cast-iron surface plates. The fact that the bands seen in Fig. 1 are straight indicates that the contacting surface of the 2-in. glass is optically flat. This important fact, that—"straight bands mean a flat surface" is simply a matter of geometry is quite evident when it is known just how the bands occur.

Dark Bands Indicate Steps of 0.00001 In.

As previously stated, the average wave length of light is 0.00002 in., and it is a proved scientific fact that the dark interference bands between two nearly flat and parallel contacting surfaces occur when the distance between the two surfaces is ½, 1, 1½, 2, 2½, 3, or an even number of half-wave lengths. Therefore the dark interference bands show vertical distances between the two surfaces of 0.00001 in., 0.00002 in., 0.00003 in., 0.00004 in., 0.00005 in., 0.00006 in. and so on, each dark band locating a step of one hundredth-thousandths or 10 millionths of an inch. This is strictly true when

looking directly down on the surfaces and practically true when viewed at a slight angle.

Thus the contacting or under surface of the 2-in. flat in Fig. 1 is not parallel to the upper surface of the 8-in. master flat. In fact, it is in contact at but one point; namely, at the right, and the wedge of air between the two surfaces is sloping upward to the left. This wedge of air is as many units of 0.00001 in. thick at the left as we can count bands starting from point of contact at the right. Thus, counting about 14 bands in the photograph, there is approximately 0.00014 in. vertical distance at the thickest part of the wedge of air.

Bands Run Perpendicular to Direction of Wedge

When a series of straight interference bands occur between two flat contacting surfaces these surfaces are not parallel, but there is always a wedge of air between them. This wedge of air may be made to slope in any direction desired, by applying pressure where it is desired to have the point of the wedge. Thus the bands may be made to run in any desired direction, but always at right angles or perpendicular to the direction of the slope of the wedge.

Number of Bands Show Steepness of Wedge

The number of bands which occur between two *flat* surfaces has nothing to do with the accuracy of these surfaces. In fact, the bands may be made as close together as desired simply by lifting or raising the upper glass opposite the point of contact. This is simply opening up the wedge of air, making more steps of

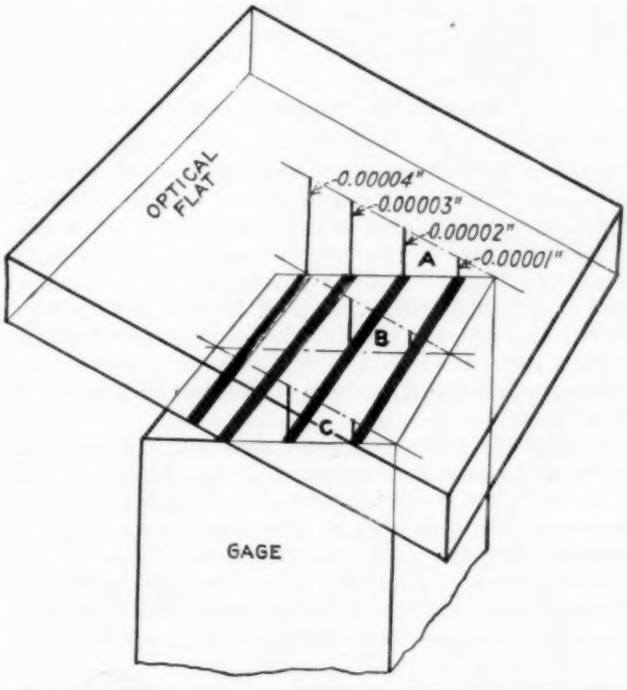


FIG. 2. EXAGGERATED CONDITION SHOWING OPTICAL FLAT MAKING ANGULAR CONTACT WITH FLAT GAGE BLOCK. STRAIGHT INTERFERENCE BANDS INDICATE FLAT GAGE SURFACES. BANDS LOCATE VERTICAL STEPS OF 0.00001 IN. BETWEEN CONTACTING SURFACES

0.00001 in., and consequently more bands occur. Conversely, by applying a downward pressure both at the point of contact and at the thick part of the wedge, it is made thinner and the steps, as located by the bands, become farther apart.

If the surfaces are accurately flat, they can be brought together so close that the distance at any point is less than 0.00001 in., and the bands disappear. Thus, when a flat gage block is wrung on a glass flat, it is generally in intimate contact, being held on the flat by a very thin film of moisture or grease within two or three millionths of an inch. If both surfaces are flat, no bands or colors will appear when viewed in monochromatic light or in daylight.

While the flatness of two surfaces can be determined by the lack of bands or interference colors when wrung together, this test is not as sensitive as determining the flatness by the straightness of the bands, inasmuch as the force exerted by the film of moisture or other liquid causing them to adhere will warp either the gage block, the optical flat or both, thus giving the appearance of perfect flatness when such is not the case. For the sake of further explanation the perspective sketch in Fig. 2 shows, greatly exaggerated, the condition which exists when a series of interference bands occurs between two flat surfaces. For simplicity in drawing there is shown a square optical flat in contact with one edge of a square gage block, and the angle or wedge between the glass and the gage is very much too large.

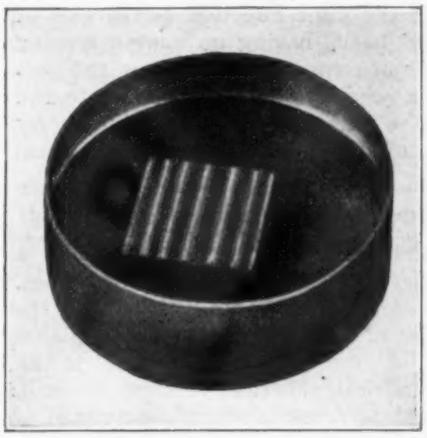


FIG. 3. A GAGE THAT IS FLAT WITHIN A MILLIONTH OF AN INCH

In Fig. 2 there is indicated the vertical distance of 0.00001 in., which is detected by the first band, and similarly the vertical distance of 0.00002 in. corresponding to the second band. Inasmuch as the test glass is flat, and as every point on the first band is the same distance from the contacting edge all of the little triangles *A*, *B* and *C* are equal. Thus it follows by geometry that "straight bands mean a flat surface," as these triangles could be equal only if the surface of the gage was flat.

The Bands Are Not Light Waves

At this point the reader will be cautioned against an occasional misunderstanding sometimes obtained in following an explanation on light wave measurement. Remembering that the light wave is a very small quantity (0.00002 in.), it is evident that the bands, which are a very noticeable distance apart, say $\frac{1}{8}$ or $\frac{1}{4}$ in., are *not* the light waves. The bands simply show the places where interference occurs at distances between the two surfaces of $\frac{1}{2}$-wave length intervals or multiples thereof.

Flat Within a Millionth

In Fig. 3 there are shown the bands occurring in the flatness test of a precision gage block produced by the writer. The bands are practically straight and uniform to within $\frac{1}{10}$ of the distance betwen the center line of any two adjacent bands. The gage in question is

therefore flat to within $\frac{1}{10}$ of our unit of measurement, the half-wave length (0.000010 in.), or within 0.000001 in. (one millionth of an inch).

Complete Flatness Test

The expert can tell, with one setting, if a surface being tested is flat, but even then it is more dependable to place the glass test-flat on the gage twice, causing the bands in the second test to run at right angles to their direction in the first test.

This is done because, if the surface being tested is very slightly cylindrical, and by chance the bands were first made to run in the same direction as the axis of the cylinder, straight bands having an uneven spacing would occur, and this unevenness in spacing might pass unnoticed. However, when the bands are made to run at right angles to the axis of the cylinder they show the exact amount of curvature of this cylindrical surface.

Curved Bands Show Curved Surface

It follows, of course, that if straight bands show a flat surface, that curved bands show a curved surface. Not only is this statement true, but in addition the curvature and shape of the bands show at a glance the exact nature of the surface, whether it be convex, concave, cylindrical, spherical or irregular, and, moreover, the amount of error is easily determined.

Anyone familiar with the meaning of a profile or contour map of a hill can realize an exact analogy of the meaning of interference bands occurring between two surfaces. The only difference is that in the case of the contour map the irregularly shaped lines, which indicate a change of elevation or height of the ground at the points on the contour lines, represent steps of 100 or 1,000 ft., depending on the scale of the map; while the interference bands show differences of elevation of only 0.00001 in. See Fig. 5, at *E*.

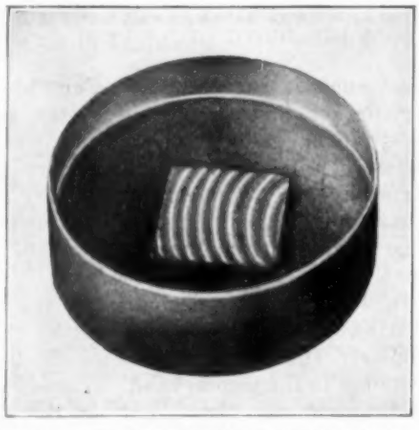


FIG. 4. A GAGE THAT IS NOT FLAT. CURVED BANDS SHOW THAT NEAR AND FAR EDGES ARE LOWER THAN THE MIDDLE BY ONE BAND INDICATING A UNIT OF 0.00001 IN.

The gage shown in Fig. 4, as determined from the curvature of the bands and the location of the point of contact is convex, being high in the center and low at the edges. The glass flat rests on the gage in contact with the right-hand edge and is sloping upward from the gage toward the left. The point of contact is located on the same side of the bands as the center of curvature of the bands. Thus the following rule applies:

FIG. 6. A REJECTED GAGE BLOCK. THE NEAR RIGHT-HAND CORNER IS LOW

When the point of contact, between the test glass and the surface being tested, is located on the same side of the curved bands as their center of curvature, the surface is convex. In the same way, with the points of contact remaining the same as in Fig. 4, and with bands having just the reverse of the curvature shown, the surface would be low in the center and high on the edges, or a concave surface. Thus we have the rule applying to a concave surface:

When the points of contact, between the test glass and the surface being tested, are located on the opposite side of the bands from their center of curvature, the surface is concave.

Most surfaces produced supposedly as flat are found, when in error, to be convex rather than concave. This is due to the difficulty in holding the edges of a surface in a true plane.

Amount of Flatness Error

Knowing that curved bands indicate a curved surface and the nature of the curvature, it is of importance to know just how much the surface is in error. Referring again to Fig. 4, it will be noted that the bands curve just about the distance between the center lines of any two bands. Now, as previously explained, each band indicates a vertical step of 0.00001 in. between the two surfaces, and since the bands curve the distance between them, the edge is lower than the center by one band or one unit of 0.00001 in. or ten millionths of an inch.

Another way of presenting the condition is as follows: In Fig. 4 the glass makes contact at the right-hand edge of the gage, and is sloping upward to the left 0.00001 in. per band. Now, looking at the second dark band, it is found that this band occurs in the middle of the gage, which is high, about $\frac{1}{4}$ in. from the contacting edge, while at the front and back edges, which are low, the second band occurs sooner, or about $\frac{1}{8}$ in. from the

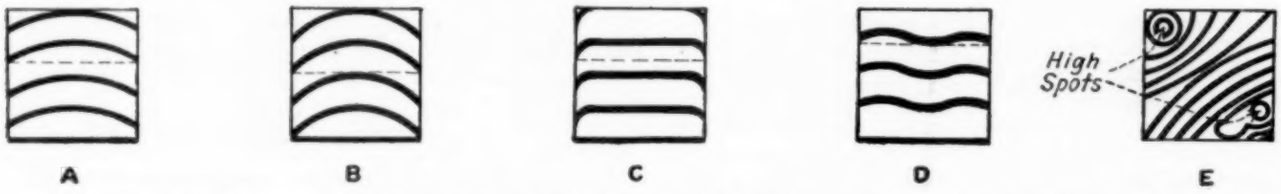


FIG. 5. DIFFERENT CONDITIONS AND DEGREES OF SURFACE ERROR. HEAVY LINES INDICATE EDGE IN CONTACT WITH FLAT

A, Convex surface—side edges low 5 millionths. B, Convex surface—Side edges low 10 millionths. C, Nearly flat—Side edges low or rounded 5 millionths. D, Surface both convex and concave—Hollow in center, higher each side of center and lower at side edges. Error 3 millionths. E, Note 2 high spots with 12 bands between, indicating a valley 6 bands or 60 millionths deep.

contacting edge. The bands being ½ in. apart, the front and back edges are therefore low by one unit or 0.00001 in.

Fig. 5 shows different conditions and degrees of surface error at *A*, *B*, *C*, etc.

The rejected gage block shown in Fig. 6 is an example of an irregular surface. The point of contact in this case is on the near edge of the gage but is confined near the left-hand corner, and the glass is sloping upward toward the far edge or back of the gage. Note that the gage is convex and that the curvature at the right near corner of the gage is very pronounced. This particular corner is 2½ bands or 0.000025 in. lower than the left near corner. Halfway back the bands do not curve more than the distance between them, and the edges are therefore lower than the center of the gage by not more than 0.00001 in. or ten millionths of an inch.

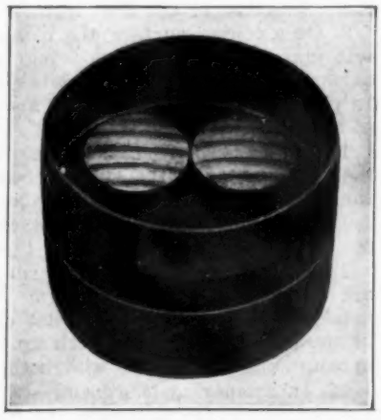


FIG. 7. COMPARING LENGTHS OF TWO GAGES. GAGE AT LEFT IS THE SHORTER BY ½ BAND OR 5 MILLIONTHS OF AN INCH

Counting Millionths

In practice it is usually most convenient to estimate the variations in the surface in tenths of a band. These tenths of a band, when the wave length used is 0.00002 in., correspond to millionths of an inch. If a wave length is used which is appreciably different it is necessary to multiply the variations of tenths of a band by a factor in order to get the result in millionths. However, the use of an even equivalent of 10 millionths of an inch per band is quite satisfactory for every-day purposes. Thus errors of ½ band are recorded as 5, one band as 10, 2 bands as 20, and 5 bands as 50 millionths of an inch.

Length Measurements

In comparing the length of a flat-end measure or gage, or a combination of gage blocks, with a known standard of the same nominal length, the process is quite as simple as that of testing flatness. This operation is shown in Fig. 7.

The block to be tested and the known standard are wrung on a glass flat side by side. They can thus come very close to being at the same temperature. A second optical flat is then laid on top of the two gages. In this case, consider the gage at the right as the standard and the one at the left as the unknown or the one being tested for length. Now, as shown in the illustration, the glass is in contact with the standard at a point near the observer and is sloping upward to the further edge of the gages. The pronounced light spots near the observer on the gages indicate contact. Note further that the bands on the unknown gage, at the left, occur about ½ a band lower down on the wedge than those on the standard gage.

It is quite evident that if the two gages, shown wrung on a lower glass flat, were both of exact and uniform thickness, that the upper surface of one gage would simply be a continuation of the surface of the other gage. Then any bands which might occur on one gage would occur exactly the same way on the other. Thus, with the upper flat in contact with both gages the bands are made to cross both gages, if they match each other, the gages are the same thickness or length.

The Shorter Gage

The shorter gage is easily identified, as its point of contact with the upper optical flat will be located lower down on the slope of the wedge than the point of contact of the longer gage. Also, if the upper surfaces of the two gages are parallel, each succeeding band from the point of contact of the shorter gage with the upper flat, will be located an equal distance lower down on the wedge than the corresponding bands on the longer gage.

Thus, referring to Fig. 7, the bands on the unknown gage at the left, occur about ½ band lower down on the wedge than the corresponding band (take in each case first, second, third, etc., band from the point of contact) on the standard. The gage at the left is therefore 5 millionths of an inch shorter than the standard.

It is well to establish the practice of always determining the amount one gage is shorter than the other. This procedure avoids confusion. Thus, if the unknown gage is shorter than the standard, its error is directly determined; and if the standard is shorter than the unknown gage, it is known at once that the unknown gage is that much too long.

Determining an Error on Several Bands

In comparing two pieces which differ by as much as one ten thousandth of an inch or ten bands, no particular difficulty is encountered. When such a difference exists, this difference is determined by counting from the point of contact on the shorter gage, the number of bands to the point of contact on the longer gage. The same difference (providing that the upper surfaces of the two gages are parallel) can be found by referring to the first band from the point of contact on each gage, the second band on each gage, or the third, etc.

The procedure is illustrated in Fig. 8. The upper flat is brought in contact with both gages. As shown, the upper flat is making contact with the right-hand corner of each gage, and is sloping upward toward the further left-hand corners. Thus, in the top view, it will be noted that 3½ bands occur from the point of contact on the shorter gage to the point of contact on the unknown gage. Therefore the standard gage is 3½

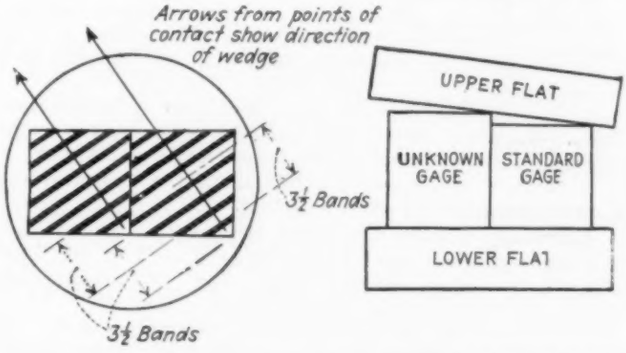


FIG. 8. COMPARING TWO GAGES WHOSE DIFFERENCE IN LENGTH IS SEVERAL BANDS. THE STANDARD GAGE IS 3½ BANDS OR 35 MILLIONTHS OF AN INCH SHORTER THAN THE UNKNOWN GAGE

bands shorter than the unknown gage, which consequently is 0.000035 in. long.

When the bands on one gage run parallel to those on the other, as is the case in Figs. 7 and 8, it means that both upper surfaces of the gages, as they are wrung on the lower glass flat, are parallel. It is evident that lack of parallelism would in reality be due to the fact that a gage was thinner at one edge than at the other. Thus the bands would tend to bend toward the point of contact at the edge of the gage, which happened to be the thinner. For a complete test of parallelism, it is necessary to make the test twice, turning one gage in the second test 90 deg. or at a right angle to its position in the first test.

Testing Separately Flatness, Length and Parallelism

If we had a mechanical means of testing the thickness of a flat gage block at several places, when all the measurements and records had been made, we would have on paper a mass of figures. From these figures it would be difficult indeed to determine which, if either, of the two surfaces was curved, or whether the thickness of the piece simply varied at the point measured. However, with the optical flat we can extend our vision, use our eyes, so to speak, ascertain and separate the errors of flatness, thickness or length, and parallelism at a glance. This separation of errors is in itself a valuable asset.

Measuring Plugs and Balls

While the detailed explanation of the procedure for measuring the diameters of plugs and balls, will not be included in the present discussion, these measurements can be quite effectively and accurately made with the aid of two optical flats. Briefly, the method involves the use of a flat standard gage block of the same nominal length as the plug or ball to be measured. By placing both the block and plug, or ball, between the two glass flats, there can be determined, by the slope of the glasses, as shown by the interference bands on the flat gage block, the difference between the diameter of the plug, or ball, and the thickness of the gage block.

Important Rules

It is believed that the following rules, summarizing the foregoing explanations, will be helpful in gaining experience and proficiency in the use of the optical flat for shop measurements:

1. If at all possible use monochromatic light or light of one color. In the absence of other information use the average value of the wave length as given above for the light chosen. Remember that each band corresponds to ½ wave length.
2. Daylight can be used quite satisfactorily for flatness tests. Estimate bands from color to color and use the approximation of one band per 10 millionths of an inch.
3. Straight bands mean a flat surface, and conversely, curved bands mean a curved surface.
4. Ordinarily when a series of bands occurs between two flat surfaces, there is always a wedge of air between them.
5. The bands always run at right angles to the direction of the center-line of the wedge.
6. The number of bands indicate the steepness of the wedge, which increases in thickness from the point of contact, an amount of ½ wave length per band.
7. The bands are not light waves but simply show the points where the light waves interfere. With monochromatic light the dark bands are the result of interfering waves, and the light spaces are the result of reinforcing light waves.
8. Be sure in flatness tests to inspect surfaces twice—the second time making the bands run at right angles to their direction in the first test.
9. On a convex surface the point of contact, between the test glass and the surface being tested, is located on the same side of the curved bands as the center of curvature. In practice, a pronounced light spot will indicate the point of contact.
10. On a concave surface the point of contact between the test glass and the surface being tested, is located on the opposite side of the bands from the center of curvature.
11. In recording variations or errors estimate tenths of the distance between the center lines of adjacent bands.
12. If two gages which are wrung on a bottom glass flat are both of equal and uniform thickness or length, the bands seen through the top flat crossing both gages will be parallel and exactly match up. The upper flat should, of course, make contact with both gages.
13. In comparing lengths always determine which is the shorter gage. On this gage the point of contact and each succeeding band will occur lower down on the wedge than those on the longer gage.
14. The lack of parallelism of the upper surfaces of two gages which have been wrung on a lower flat is detected by lack of parallelism of the bands on the two surfaces.
15. The complete test for parallelism of two gages requires two tests, the second test being made with one of the gages turned 90 deg. or at a right angle to its position in the first test.
16. If two surfaces are properly wrung together, they are held in intimate contact by a very thin film of liquid within 2 or 3 millionths of an inch, and are too close for bands to occur if the surfaces are flat.
17. The presence of interference colors sometimes seen between a glass flat and a gage which is wrung on the flat, indicates that the wringing is not perfect or that the gage surface is not flat. This test is not recommended as the tension of the liquid which causes the two surfaces to wring, distorts either the gage or the glass flat or both.

Thus it can be said that, with the optical flat, a very simple measuring tool, we are literally and figuratively not working in the dark, but in reality are using light as a standard of measurement in a most accurate, rapid and practical manner.

When we can measure a piece we can duplicate it, and thus, by the application of these essential facts resulting from scientific endeavor, we have increased our ability to improve manufactured products—from the original reference standard to the crankshaft of an automobile. Is this not, therefore, a step forward in the world's industrial progress?

Standard Sizes for Shafting

The desirability of reducing the number of sizes of shafting and in consequence the number of parts of power-transmission equipment that must be carried in stock has long been recognized. It remained for the conditions of the war, however, to bring about definite action in this regard, from the standpoint of the conservation of materials. The activities of the Committee of the American Society of Mechanical Engineers on War Industries Readjustment brought to light the fact that an immense amount of steel is continuously tied up in manufacturers' and dealers' stocks of shafting and that a corresponding amount of cast iron is also held in stock in the form of hangers, bearings, couplings, collars, bushings, pulleys, etc. At the suggestion of the chairman of the Committee on War Industries Read-

justment, therefore, a committee was formed to investigate the subject of the standardization of shafting sizes. The personnel of this committee is as follows:

Cloyd M. Chapman, chairman; Hunter Morrison, Russell E. Nelles, George N. Van Derhoef. Louis W. Williams.

This committee was confronted with two distinct but closely related problems, viz., the standardization of the diameters of shafting used for the transmission of power, such as lineshafts, countershafts, etc., and the standardization of the diameters of shafting used by machinery manufacturers in making up their product. The first of these problems seemed to be the simpler of the two. While a large number of sizes of transmission shafting are now listed and stocked, it was believed that a comparatively few of these are in extensive general use. Accordingly, a letter was sent to thirty-six of the largest manufacturers and dealers in transmission shafting asking for statistics on the consumption of each size of shafting handled by them. Some twenty of the largest concerns in the industry furnished complete statements of their sales over periods of time chosen by themselves. These data were reduced by the committee to a uniform basis of percentages. The amount of each size sold was expressed as a percentage of the total sales, both on a weight basis and on a lineal foot basis. From these data plotted in the form of a diagram, it was very evident which of the sizes were popular and generally used and which were more rarely called for. A tentative list of twelve sizes was prepared from this diagram and sent to forty-six dealers in transmission shafting and shafting supplies from whom twenty replies were received.

In the letters to these firms, the committee expressed the opinion that the custom of using shafting $\frac{1}{16}$ in. under the unit sizes is so firmly and so nearly universally established in this country, that it would be unwise to attempt to adopt sizes in even inches and fractions as standard. It was pointed out, also, that certain sizes stand out preëminently as "popular sizes" and that others are sold in relatively small quantities. It seemed very feasible to select a series of standard sizes which would meet the popular demand and give a sufficient selection of sizes for general purposes and at the same time reduce the number of sizes now listed by the trade from some fifty or sixty down to twelve or fifteen.

The response to these letters was hearty and practically unanimous in opinions. The transmission-shafting users and dealers, almost to the last one, approved the plan of standardization and the sizes suggested were very generally approved except that the diameters $1\frac{15}{16}$ in. and $2\frac{15}{16}$ in. were in many cases requested to be included. After due consideration the committee decided to include these two sizes in the original list, making 14 sizes now adopted as standard.

The second problem was a more intricate one. The number of sizes now produced by the rolling mills for use in machinery is very large. Almost every sixty-fourth of every inch up to three inches is drawn. This means excessive equipment at the mills and large stocks in the warehouses. If a reasonable number of these sizes could be eliminated or classed as "Specials" and a comparatively few sizes selected as standard or stock sizes a great saving would thus be effected and a valuable service performed.

In order to get the opinions of leading consumers of shafting for machinery purposes, the committee decided to lay the plan before some 225 large consumers of this material and invite their comment upon its desirability or feasibility and their advice as to the size interval between standard diameters which should be considered. It was explained that it was not intended that the adoption of certain sizes as standard should make it impossible to secure any other size required on special order; but that the general elimination of a great number of the sizes now in use and the consequent greatly increased production of the standard sizes could only tend to a reduction of mill costs and capital invested in manufacturers' equipment and in stocks in warehouses. Both of these savings should have a lowering effect upon the price to the consumer and the problem was, therefore, truly one of conservation.

In the case of machinery shafting the users were equally unanimous in their approval of the plan to standardize sizes, but recommendations as to size interval varied greatly. However, these recommendations, in so far as they were definite and specific enough, were tabulated and a diagram constructed showing the relative popularity of the various size increments for each inch of diameter.

With these data accumulated and sifted down to usable form the committee felt that it was in a position to present its information and preliminary deductions to representatives of other interested organizations. Accordingly, invitations were issued to twelve societies and associations requesting them to consider the proposed lists of standard sizes and to appoint representatives to confer with the committee before its report was finally formulated. The seven organizations listed below responded and the standard sizes which follow have the unanimous approval of these representatives and, as far as can be learned, of their associations.

American Hardware Manufacturers' Association.
American Railway Engineering Association.
American Supply and Machinery Manufacturers' Association.
National Association of Manufacturers of the U. S. A.
National Association of Purchasing Agents.
National Machine Tool Builders' Association.
Southern Supply and Machinery Dealers' Association.

The committee then considered that it had completed the first part of the work to which it had been assigned, so on January 14 submitted to the council a progress report in which it recommended the approval and adoption of the following lists of sizes as standard:

Transmission Shafting:

$\frac{15}{16}$ in.; $1\frac{7}{16}$ in.; $1\frac{15}{16}$ in.; $2\frac{3}{16}$ in.; $2\frac{7}{16}$ in.; $2\frac{15}{16}$ in.; $3\frac{7}{16}$ in.; $3\frac{15}{16}$ in.; $4\frac{7}{16}$ in.; $4\frac{15}{16}$ in.; $5\frac{7}{16}$ in.; and $5\frac{15}{16}$ in.

Machinery Shafting:

Size intervals extending tc $2\frac{1}{2}$ in., by sixteenth inches; from $2\frac{1}{2}$ in., to 4 in., inclusive, by eighth inches; from 4 in., to 6 in., by quarter inches.

The Council approved the report and accepted the recommendations.

In the opinion of the committee the adoption of standard sizes of shafting will mean that in the future there will be a gradual elimination of odd sizes from makers' lists and from dealers' stocks, and for new construction only standard sizes would be selected.

Before undertaking the standardization of the shafting formulas and the dimensions of shafting keys and keyways the committee plans to reorganize itself and add to its membership.—*Mechanical Engineering.*

A Grinding Attachment for a Milling Machine

By JACK FINLAY
Toolroom Foreman, Commonwealth Small Arms Factory, Lithgow, New South Wales, Australia

This article describes a special grinding attachment for use on a milling machine, it being designed for accurate toolroom work on gages. Because of the wide range of utility of the device, a complete set of drawings for its construction are here given.

IN MAKING gages for rifle manufacture, many cases arise in which it is necessary to grind holes in pieces that are too long to swing in either a universal grinder or lathe, or so unwieldly that the time required for setting up is long in comparison with that taken for grinding. In order to care for this circumstance the device described here was developed in the toolroom of a small-arms factory and it has proven itself to be very useful.

Fig. 1 shows the grinding attachment in use, it being designed to fit a Brown & Sharpe No. 2 plain milling machine. The part *A*, which is held in a vise on the milling machine table while it is being ground, is a gage used on the front end of the trigger-guard seating of a rifle. In this particular case, the attachment is very handy, as it is possible to apply the reference gage to the gage being made, indicate by the reference gage and then remove it and grind the hole in the new gage, which is held in the vise. It is an easy matter to "indicate" a job with this arrangement by means of the vertical and longitudinal movements of the milling machine table.

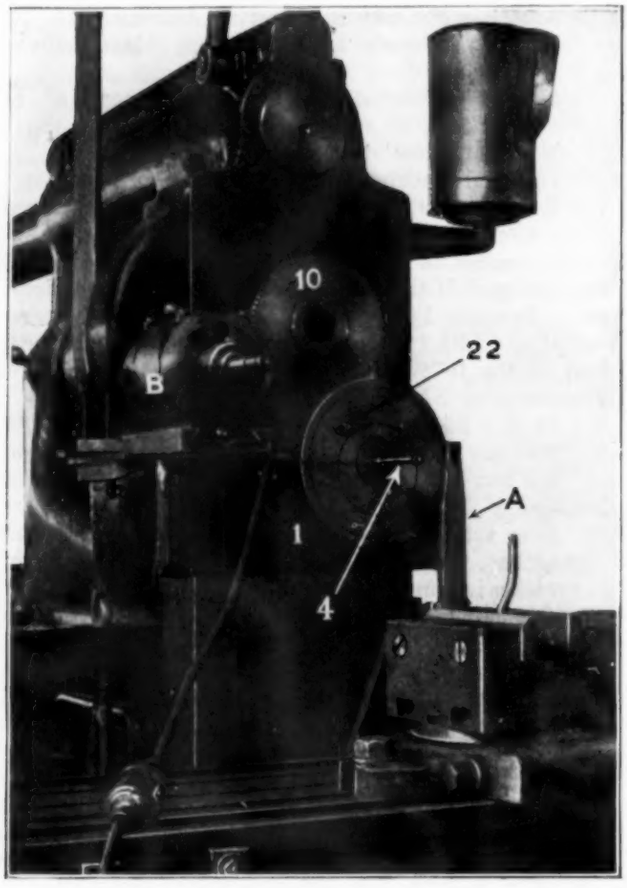


FIG. 1. FRONT VIEW OF THE ATTACHMENT IN USE

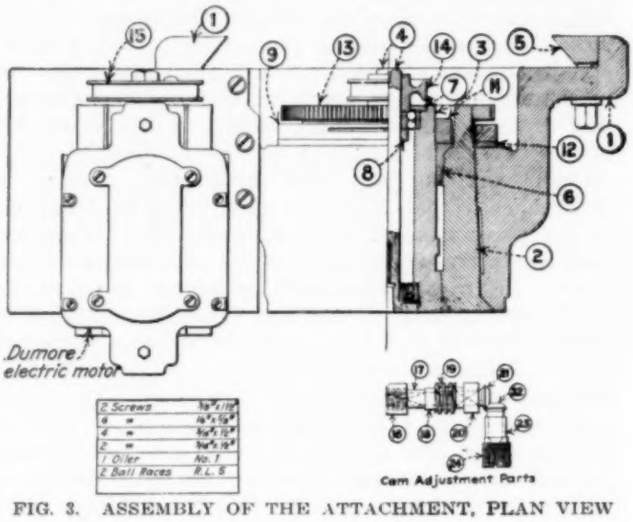


FIG. 3. ASSEMBLY OF THE ATTACHMENT, PLAN VIEW

Construction of the Fixture

While Fig. 1 shows a front elevation of the attachment, Fig. 2 is an assembly drawing of it, showing the plan view, and Fig. 3 gives the dimensioned details of all parts. These parts are numbered the same in each figure, and hence will be referred to by the numbers indicated in the cuts.

During grinding the power feed of the saddle is used to give a reciprocating motion to the work. The spindle *4* carrying the grinding wheel is run by the motor *B*, and it is also caused to rotate eccentrically in order to provide the feed for the grinding wheel. This latter motion is imparted from the spindle of the milling machine by the gear *10*, as will be explained later.

Part *1* is a casting which clamps on the face of the column of the milling machine by means of gib *5* and forms the housing in which Part *2* revolves, a running fit being made. At the rear end of *2* is fitted a fiber thrust washer *12* and a split nut *9*, by means of which wear can be taken up. At the extreme end of *2* is fitted gear *13*, which is driven by gear *10* on the spindle of the miller. The bushes *2* and *3* are both bored out with an eccentricity of ¼ in., *3* fitting inside of *2*. The cone bushing *6* fits on the rear end of *3*, any wear being taken up by the adjusting nut *11*.

The Eccentric Motion

On the outside of *3* is cut a straight-toothed worm-wheel, with which the worm *19* meshes. The worm is keyed to the miter-gear shaft *21*, which runs in the bushes *20* and *17*. Bushes *20* and *16* fit in the hole drilled at right angles to the main axis of *2*, *16* being secured in place by a setscrew. Since *17* is threaded in *16* it is possible to adjust the position of the bevel gear *21* by turning bush *17*. Referring to Fig. 2, it can be seen that miter gear *21* engages miter gear *22*, on the

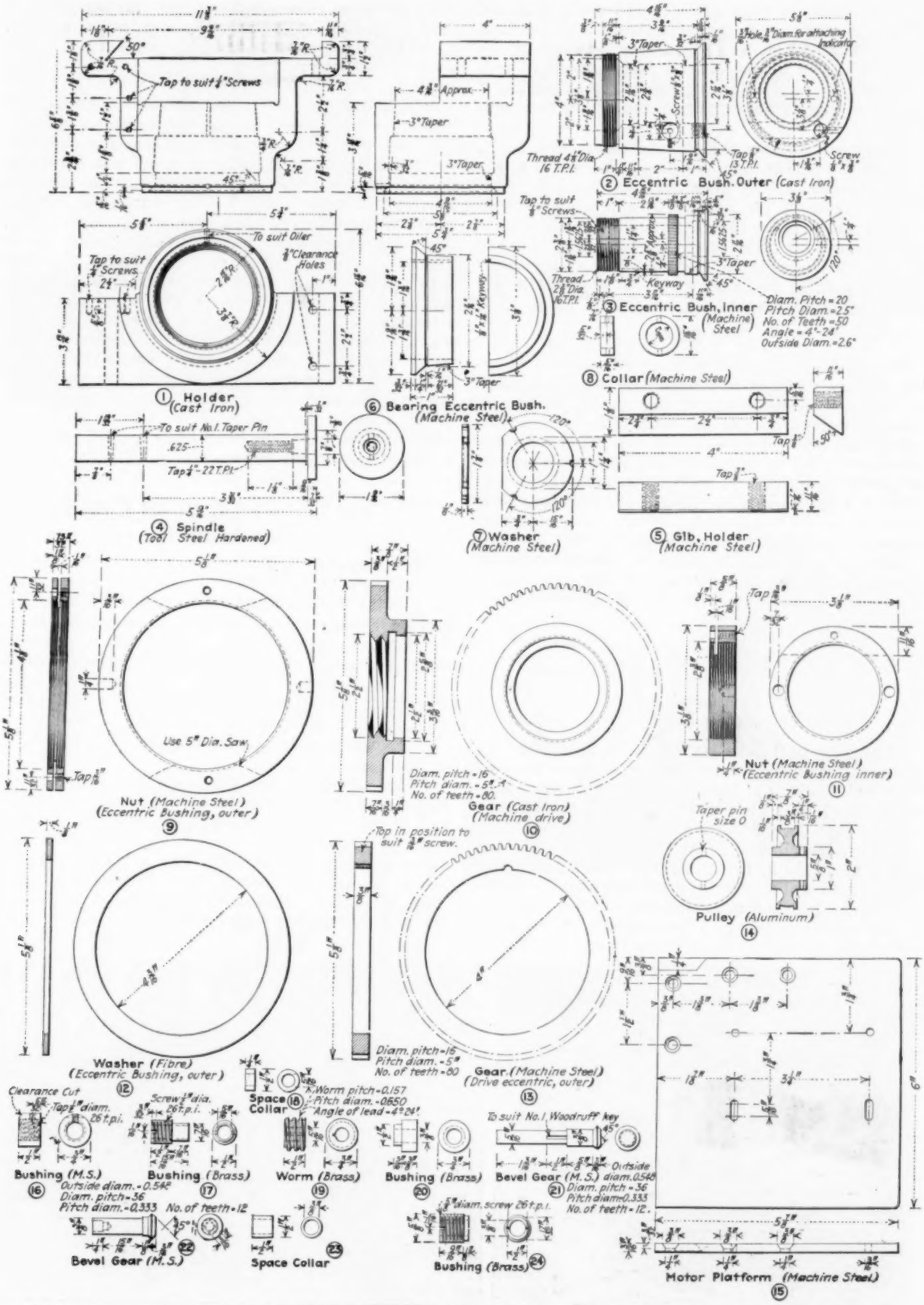

Tap to suit ¼" Screws
To suit Oiler
¾" Clearance Holes
Tap to suit ¾" Screws
① Holder (Cast Iron)
② Eccentric Bush. Outer (Cast Iron)
Thread 4⅛" Dia. 16 T.P.I.
Tap ⅜ 13 T.P.I.
Hole ⅜" Diam. for attaching Indicator
Screw ⅜ x ⅞
Tap to suit ¼" Screws
Thread 2⅜" Dia. 16 T.P.I.
Keyway
③ Eccentric Bush. Inner (Machine Steel)
Diam. Pitch = 20
Pitch Diam. = 2.5"
No. of Teeth = 50
Angle = 4°-24'
Outside Diam. = 2.6"
⑥ Bearing Eccentric Bush. (Machine Steel)
⑧ Collar (Machine Steel)
To suit No. 1 Taper Pin
Tap ¼" - 22 T.P.I.
④ Spindle (Tool Steel Hardened)
⑦ Washer (Machine Steel)
⑤ Gib, Holder (Machine Steel)
Use 5" Dia. Saw
Nut (Machine Steel) (Eccentric Bushing, outer) ⑨
Diam. pitch = 16
Pitch diam. = 5"
No. of teeth = 80
Gear (Cast Iron) (Machine drive) ⑩
Nut (Machine Steel) (Eccentric Bushing inner) ⑪
Taper pin size 0
Pulley (Aluminum) ⑭
Top in position to suit ⅜" screw.
Washer (Fibre) (Eccentric Bushing, outer) ⑫
Diam. pitch = 16
Pitch diam. = 5"
No. of teeth = 80
Gear (Machine Steel) (Drive eccentric, outer) ⑬
Clearance Cut
Tap ⅜" diam. 26 t.p.i.
Bushing (M.S.) ⑯
Outside diam. = 0.542"
Diam. pitch = 36
Pitch diam. = 0.333
Screw ⅜" dia. 26 t.p.i.
Bushing (Brass) ⑰
No. of teeth = 12
Space Collar ⑱
Worm pitch = 0.157
Pitch diam. = .0650
Angle of lead = 4° 24'
Worm (Brass) ⑲
Bushing (Brass) ⑳
To suit No. 1 Woodruff key
Bevel Gear (M. S.) ㉑
Outside diam. 0.548
Diam. pitch = 36
Pitch diam = 0.333
No. of teeth = 12.
Bevel Gear (M. S.) ㉒
Space Collar ㉓
⅜" diam. screw 26 t.p.i.
Bushing (Brass) ㉔
Motor Platform (Machine Steel) ⑮

FIG. 3. DIMENSIONED DETAIL DRAWINGS OF THE PARTS OF A GRINDING ATTACHMENT FOR A NO. 2 B. & S. MILLING MACHINE

shaft of which the space collar *23* and the bush *24* fit. Bush *24* is screwed into the front face of *2* and secured in the proper position by a setscrew. When shaft *22*, see Fig. 1, is turned by means of an internal wrench, bush *3* is caused to revolve slowly in bush *2*, thus making it possible to vary the eccentricity of the spindle from zero to ½ in.

In each end of *3* an S.K.F. ball bearing, size R.L.5, is fitted, the spindle *4* running on these and the rear bearing being held in place by the washer *7*. End thrust is taken by the rear ball race, which is held in place by means of the collar *8* on one side of it and the aluminum driving pulley *14* on the other. The front end of spindle *4* is ground out to a No. 3 Jarno taper and is threaded also, so that arbors hold by screwing in and pulling up on the taper.

The Drive

The spindle is driven by a small Dumore electric motor, a rubber driving belt, which accommodates itself to the eccentric movement of the spindle, being used between pulleys *14* and *15*. Thus the drive of the spindle and its feed, or eccentric rotation, are entirely independent, and any speed of the milling machine may be used to revolve *2*. To vary the amount of eccentric rotation it is necessary to stop the drive of the milling machine and to turn shaft *22*, as before explained, although the motor *B*, may continue to run.

With this attachment, grinding jobs which were really quite awkward have been done with ease, due largely to the wide range of movements of the miller table and knee.

Hardening Teeth in Flywheels

By Fred H. Colvin
Editor, *American Machinist*

The advent of the electric starter has introduced new problems in motor manufacture, one of these being the wear and breakage of the gear teeth cut in the flywheel where this type of starter is used. Various methods of overcoming this difficulty are used by different manufacturers, including the fastening of a separate steel ring-gear on the flywheel, both for the purpose of taking the wear and allowing renewal should it ever become necessary. Repair men usually find the maximum wear at two opposite points on a four-cylinder engine, and at three points on a six-cylinder engine, this being due to the fact that the engine normally stops at these points due to the compression in the cylinders.

The Pierce-Arrow Method

A few builders are using cast-steel flywheels, the harder material presenting greater resistance to wear than cast iron. The Pierce-Arrow company goes this one better by using a cast-steel wheel and hardening the teeth as shown in Figs. 1 and 2. The complete apparatus is shown in Fig. 1, this consisting of a watertight tank in which the flywheel *A* is mounted as shown. The oxy-acetylene torch *B* heats the teeth locally. After the teeth are heated sufficiently for hardening, the wheel is turned in the direction of the arrow by a ratchet *C*, this being operated by the small electric motor *D*. This arrangement heats and hardens the teeth as they pass the torch and has been found more satisfactory than any other method. It does not seem to distort the flywheel as might be supposed, and has proved to be a very satisfactory arrangement.

Fig. 2 shows the position of the heating torch with relation to the teeth, the flame being applied very close to the surface of the water.

Drilling Out 88 Cu.In. of Cast Iron Per Minute

The Cleveland Twist Drill Co., during its drilling exhibitions at Atlantic City in connection with the exhibit of the Railway Supply Manufacturers Association, held on Young's Pier, June 9 to 16, accomplished the following wonderful drilling: With a 1¼-in. diameter milled high-speed drill they attained a drilling speed of 72 in. per minute in cast iron. The peripheral speed was 235 ft. per minute and the feed 0.10 in. per revolution. The drill stood up for a total of 15 in. This means that the metal was being removed at the rate of 88 cu.in., or 23 lb. per minute.

In tests on machinery steel with the same kind and size of drill, the maximum rate attained was 24.54 cu.in., or 7 lb. per minute. A depth of 3 in. was drilled.

Such rates of drilling cannot be practiced in commercial work, and are noteworthy chiefly in that they demonstrate the ultimate possibilities of these high-speed drills, and indicate that drilling practice has not reached the highest efficiency in many plants.

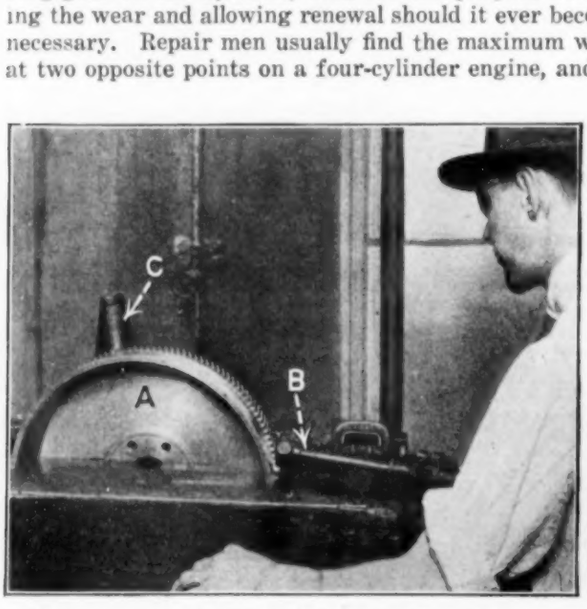


FIG. 1. THE FLYWHEEL-HARDENING OUTFIT

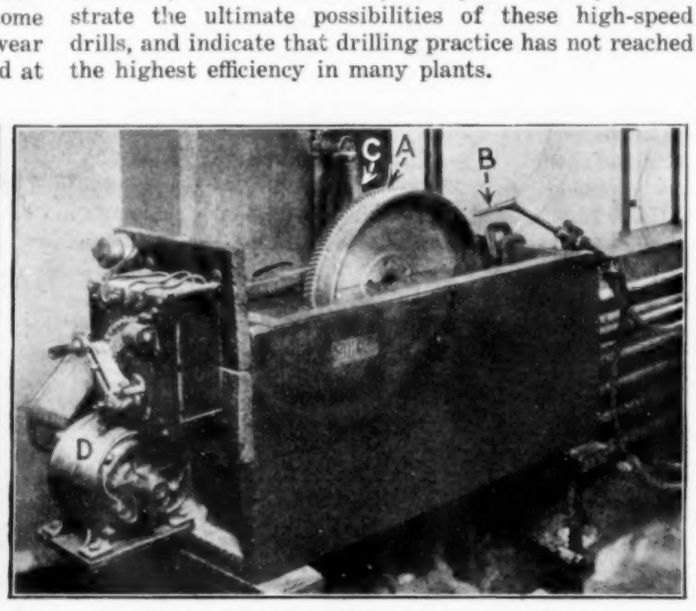
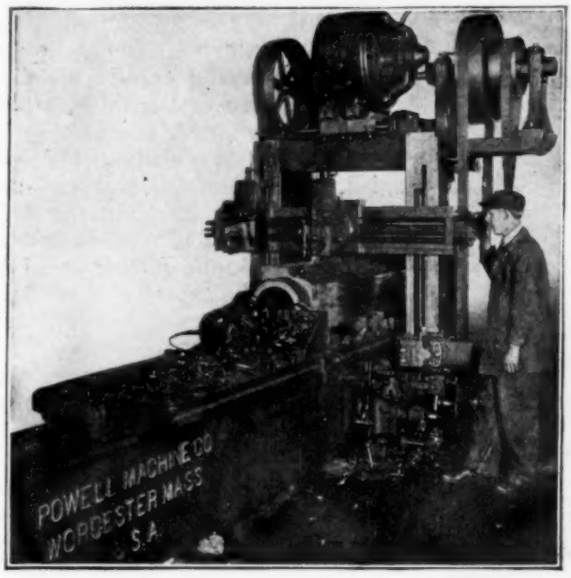


FIG. 2. SHOWING POSITION OF BURNER



POWELL "Fly-Speed-Cut" PLANING MACHINES

By E. L. Dunn
ASSOCIATE EDITOR, AMERICAN MACHINIST

About forty years ago a small planing machine was exhibited at the Mechanics Institute, Boston, and a little later a similar machine was installed at Girard College, Philadelphia, where it is still in use. These machines were the first of a type that has been manufactured continuously, passing through many developments and culminating in the present-day design that is here described.

ALTHOUGH Powell planing machines had been manufactured for many years under different names, it was not until August, 1908, that the "Hy-speed-cut" type was introduced by the Powell Machine Co., Worcester, Mass. Prior to this date the machine was known simply as a well-built tool of good design and standard construction, but with the introduction of the patented accelerating drive feature, it attracted much favorable attention both in this country and in Europe where it was exhibited and demonstrated.

As a matter of passing interest and to illustrate the progress that has taken place, planing machines built by A. M. Powell in 1881 and 1884 are shown in Figs. 1 and 2. As a comparison Fig. 3 shows a 48 in. x 17 ft. machine of latest design, for belt drive. The accelerating drive is the logical result of a study of the difficulties of planing machine operation and is based on the theory that planing speed is limited principally because of the hammer-like blows received by the tool when starting the cut, and to the excessive power required to reverse a fast moving table.

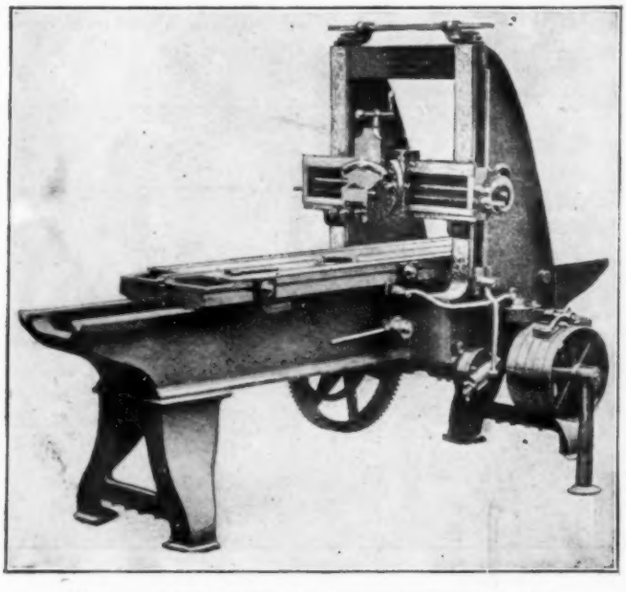


FIG. 1. THE FIRST MACHINE BUILT IN 1881

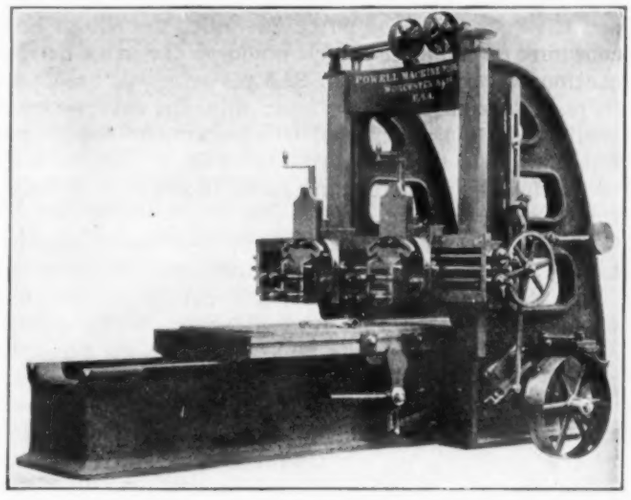


FIG. 2. ONE OF THE TYPES BUILT IN 1884

Difficulties of Planing Machine Drive

In cutting cast iron, using the best grades of high-speed steel for the cutting tools, the generally accepted economical speed varies from 30 to 50 ft. per min., while for some other metals the speed may be increased to 60 ft. or more. The density of hardness of the material to be cut determines very materially the proper cutting speed. At these higher speeds the blow which the tool receives when entering the work shortly dulls its cutting edge, as the intensity of the blow varies according to the square of the velocity.

As the return stroke of a planing machine represents practically dead loss, it is customarily operated at a greatly increased speed over that of the cutting stroke. However, a slight increase in the cutting speed is of

FIG. 3. TYPICAL "HY-SPEED-CUT" PLANING MACHINE

more relative importance as the net gain is greater. For instance, with a cutting speed of 30 ft. per min. and a return speed of 90 ft. per min. the actual time consumed in doing the work would be the same as if a continuous cutting speed of 22.5 per min. was used. To increase this speed to 25 ft. per min. the reverse speed would have to be increased 66 per cent, or 150 ft. per min., whereas the same results could be obtained by increasing the actual cutting speed 16 per cent, amounting to 35 ft. per min.

The power required to reverse a planing machine table varies, according to conditions, from three to six times the power required for the cut, this being due principally to both the flywheel effect of the pulleys and the momentum of the table. To meet the excessive power requirement due to the reverse, flywheels have sometimes been used on the continuous running overhead countershaft, and to reduce the flywheel effect of the reversing pulleys they are frequently made of aluminum.

The Powell accelerating device was designed to overcome some of the difficulties common to planing machine operation as set forth, and should not be confused with what is generally known as a variable speed drive. The accelerating feature applies only to the differential stroke of the table, which starts at slow speed, accelerating to high speed and finishing at slow speed. As a result of this variable movement the impact of the tool against the work is reduced to the minimum while the cutting speed is increased to the capacity of the tool and finally the power required for the reverse is greatly decreased.

The chart, Fig. 4, illustrates the theoretical value of the accelerated stroke in comparison with that of doubling the cutting or the return speed of a non-accelerated stroke. Fig. 5 is reproduced from a nickel steel chip made with the accelerated stroke; the roughened end, resembling teeth, indicates clearly the slow-speed effect of the cut, while the smooth body of the chip shows the paring action of the high-speed cut.

The operation of the accelerating, or "Hy-speed-cut," planing machine is similar to that of other planing machines with the following exceptions: The operating shaft that passes through the machine bed is provided with a primary or initial slow-speed pulley, a second or high-speed pulley and their mating loose pulleys. These pulleys are respectively actuated by a slow-speed drive belt and a high-speed drive belt from the overhead countershaft. The usual tight and loose pulleys are also provided for the quick return, or reverse action, belt which is likewise run from the overhead countershaft. The slow-speed or initial drive pulley is connected with the shaft by an internal roller clutch that gives connection in one direction of rotation and releases in the other; in other words, a releasable friction ratchet, similar in principle to the coaster-brake device used on a bicycle. The high-speed pulley, however, is keyed solidly to the shaft. In addition to the usual table dogs, two or more extra dogs are provided as shown in Fig. 3. When the machine is running the table dog shifts the belt in the usual way at the beginning of the stroke and the table starts forward with a slow movement. When the tool has entered the work for a distance of

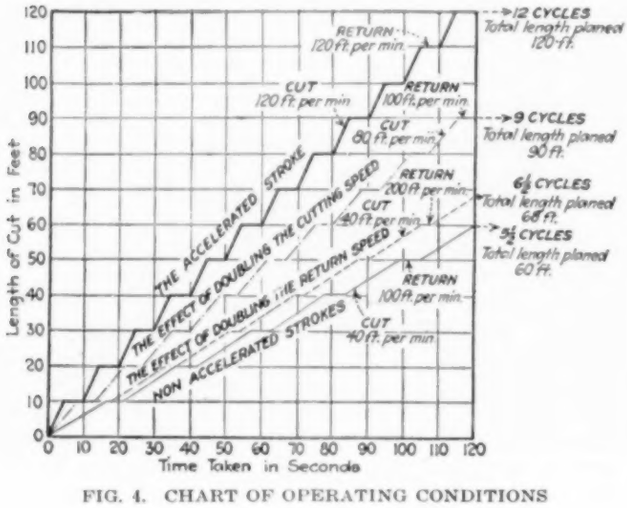

Length of Cut in Feet
Time Taken in Seconds
0 10 20 30 40 50 60 70 80 90 100 110 120
RETURN 120 ft. per min.
CUT 120 ft. per min
RETURN 100 ft. per min.
CUT 80 ft. per min.
RETURN 200 ft. per min.
CUT 40 ft. per min.
RETURN 100 ft. per min.
CUT 40 ft. per min.
THE ACCELERATED STROKE
THE EFFECT OF DOUBLING THE CUTTING SPEED
THE EFFECT OF DOUBLING THE RETURN SPEED
NON ACCELERATED STROKES
12 CYCLES Total length planed 120 ft.
9 CYCLES Total length planed 90 ft.
6⅔ CYCLES Total length planed 68 ft.
5⅔ CYCLES Total length planed 60 ft.

FIG. 4. CHART OF OPERATING CONDITIONS

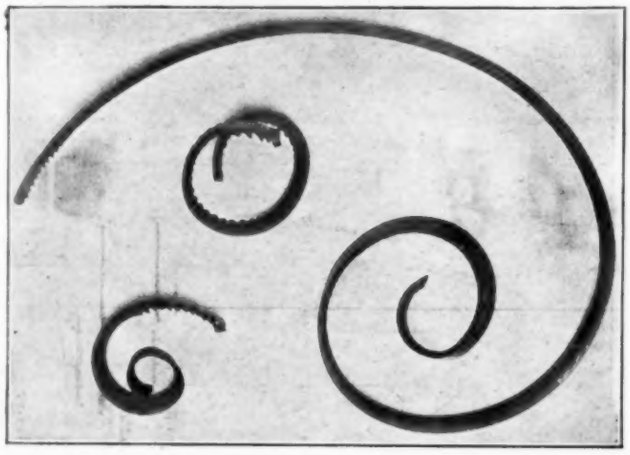


FIG. 5. NICKEL STEEL CHIPS SHOWING BY THE ROUGH ENDS THE SLOW-SPEED START AND FINISH

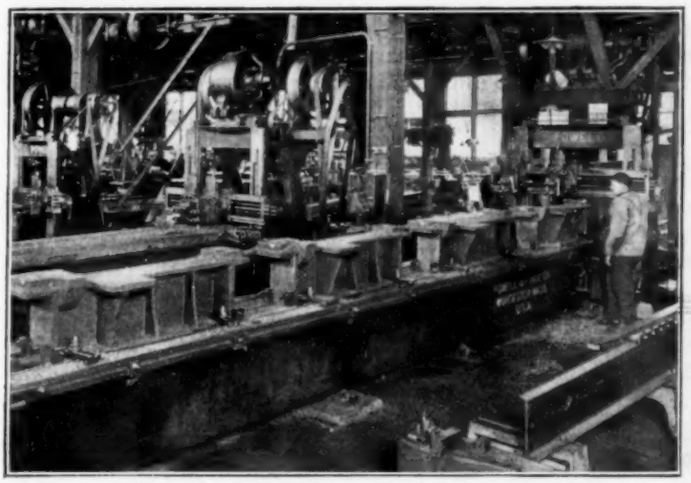


FIG. 6. ACCELERATED STROKE USED FOR JUMPING GAPS

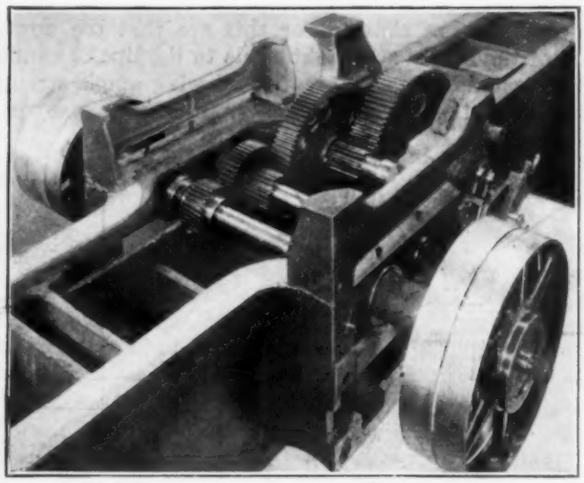


FIG. 7. GEAR TRAIN IN 30-IN. MACHINE

1 in. or less, a second table dog shifts the other driving belt to the high-speed pulley. With the shifting of the high-speed belt the speed increases and draws away from the initial drive in an increasing ratio to a point determined by the belt velocity of the high-speed drive. The table now runs at high speed until near the end of its stroke, when a third table dog shifts the high-speed belt to off position allowing the slow-speed drive to again become effective. The table, while thus running at slow speed, is reversed in the usual manner by the end dog and returns in the regular way at high speed to the starting point where the speed is again reduced. Any number of accelerating and retarding dogs may be arranged on the table for successively and repeatedly effecting the acceleration and retardation of the stroke to suit conditions, as shown in Fig. 6.

The accelerated cutting speed is usually about two and one-half times that of the slow speed, and the reverse speed never exceeds the accelerated cutting speed. The accelerating device may be put out of commission at any time by simply lifting a latch or tappet which operates the accelerating belt shifter. The machine thus arranged has practically four speeds, as the countershaft has two sets of tight and loose pulleys. The greatest efficiency of the accelerating cut is obtained on long, continuous work, but the percentage of gain is the same if the work is only one foot in length.

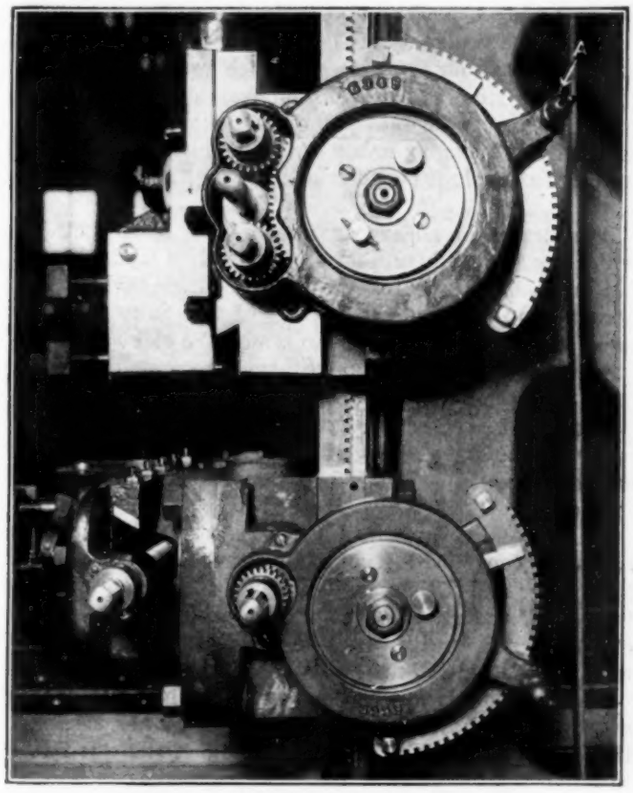


FIG. 8. FEED CHANGING DEVICE

Planing a Nickel-Steel Forging

As an example of a planing operation, a 3 per cent nickel-steel forging, having a surface of 1 ft. 4 in. x 6 ft. 6 in., was recently machined. A cut $\frac{1}{4}$ in. deep with a feed of $\frac{1}{8}$ in. was made by a Stellite No. 4 tool. The tool entered the work at a speed of 30 ft. per min., the accelerated speed being 75 ft. per min., a higher speed being impossible owing to the incapacity of the motor. Upon completion of the work the tool was found to be in excellent condition and capable of considerable additional work. The forging, which was air chilled, had been annealed for 10 hr. at 950 deg. C. (1,710 deg. F.) and had the following composition in percentage:

Carbon 0.42, manganese 0.56, phosphorus 0.031, sulphur 0.026, silicon 0.16, nickel 3.08, chromium 0.08, copper 0.05.

The accelerated cut is also used to advantage in planing work having one or more open spaces, as illustrated in Fig. 6. The planing machine shown is a 36-in. size widened to 48 in. and has a table 30 ft. long equipped with accelerating and retarding dogs. It is claimed the saving in time in this case amounted to 40 per cent or more.

Other Features of Construction

The gear-train drive, consisting of wide face steel gears, is shown in Fig. 7, and the feed changing devices for the vertical and horizontal feeds are shown in Fig. 8. The feed may be changed while the machine is in operation by shifting the handle *A* to the desired notch. The heads can be supplied with automatic horizontal feeds when required. Attention is called to the leveling blocks shown below the bed in Fig. 6. The screw and wedge arrangement has been found a great convenience for leveling the machine at the time it is installed.

Another innovation is the table slot shown in Fig. 9.

The advantages claimed for this are that the upward pull of the bolt is at a right angle to the line of contact, as indicated by the arrow, thus allowing ample strength even after the table has become thin from many sur-

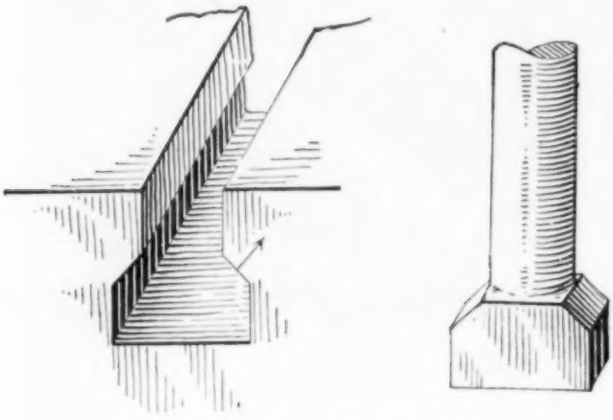


FIG. 9. TABLE SLOT AND BOLT

facing cuts. Another advantage is that the bolt head is not only much stronger, but is also positively locked against turning.

The larger size machines are furnished with either belt drive or direct motor drive as required.

Ingenuity

By John S. Watts

I have known of engineers who failed to solve problems in design, because of the lack of ingenuity, and it appears to me that the training acquired at college does not tend to develop whatever quality of ingenuity the student may have possessed. As a college can, of necessity, only teach its students that which is already known, it is doubtless unreasonable to blame the college for lack of ingenuity in its graduates. The idea I would like to bring out is that each man should himself endeavor to cultivate the ability to attack a problem on new lines when the orthodox solutions are not applicable.

Instances are common where well-eduacted and competent engineers have failed to find the solution of a problem because they considered only the regular methods and the solution has been suggested by men of much less technical knowledge, but of greater ingenuity. We have all heard the story of the "damphool" who did not know that a certain thing was impossible and so just went ahead and did it.

The habit of considering an engineering problem incapable of solution if the said problem is not amenable to common methods is a habit that has led to considerable criticism of us by our business associates in the past.

It is often the subject of adverse comment by financial men that the engineer will always say, when confronted by any problem that is a little unusual, that it cannot be done; but if pushed to it he will always find some way to do it. The result of this attitude is that the engineer loses credit while the financial man is imbued with the feeling that the credit is his, because the solution was found only upon his insistence after the engineer had said it was impossible.

My opinion is that it is much better, when confronted with a difficult and unusual problem, to say that, while it will be hard to accomplish, if there is a way to do it it will be found. There is nearly always some method by which the difficulty can be overcome or got around.

What Ingenuity Can Do

To give a few examples of what I mean by ingenuity: A smokestack was being built which on account of its being in a prominent place in the city had to be made as neat in appearance as possible. The inspection was very severe, and it was impossible to get the rivet heads exactly in alignment, when driving them in the usual way with the head of the rivet inside of the stack. In forming the head outside they would come a little out of line one way or the other and present an unsightly appearance. This was finally overcome by putting the rivet in from the outside, and heading it over on the inside. The head of the rivet that showed outside of the stack, being the original head, was necessarily concentric with the body and therefore could not help being in line.

Another example was in the case of a twenty-ton jib crane to be installed on the end of an ore loading pier. The structure was only four feet from the face of the wharf and this space had to be kept clear of all obstruction as it was used for a pathway in handling a ship at the wharf. The project was turned down as impossible by the experts because there was not space for the bull wheel at the bottom of the mast. However, a solution was insisted upon, and was finally found by placing the bull wheel on top of the mast. This, so far as I know, had never been done before and it involved a very different arrangement of the hoisting rope and sheaves.

A car plant was falling behind seriously on its schedule, due mainly to a lack of planning which had resulted in the bulldozers being overloaded with work while the hydraulic presses had not enough work to keep them going. The die designing experts claimed that as all the dies were made to suit the bulldozers the only solution of the difficulty was to design and make up new dies to do the work on the presses, which would take weeks of valuable time. The situation was saved by a newcomer to the car business, who, by various experiments, adapted a sufficient number of the bulldozer dies to the presses to enable them to take their legitimate share of work.

The desire to adhere to known and tried methods which have proved successful is in itself a laudable one, but it should not be followed to the entire exclusion of new methods. Some of the lack of ingenuity is, I believe, partly due to the way in which the older men frequently reject the designs of the younger men with contempt because they do not follow orthodox lines, thus tending to make the younger men feel that only those methods that have already been used and tried out are admissible and that, therefore, a knowledge of these old methods is all that is worth cultivating.

I believe that any idea brought forward should be seriously considered if only to inculcate the habit of ingenuity; and if the new idea is not sufficiently promising to warrant using it, the originator should be advised of the reason for its rejection and not simply given to understand that it is turned down because it is new.

The decision as to whether a new idea is worth trying out should be based upon the saving or higher efficiency that may be expected from its use, and if there is found to be no advantage in it the older method is to be preferred.

Characteristics, Treatment and Uses of High-Speed Tool Steel

THE following information has been sent out by the Division of Metallurgy of the Bureau of Standards in response to inquiry. The general importance of the subject will make the facts given of wide interest.

DEVELOPMENT. The history of the cutting of metals with steel tools is characterized by three well-defined stages each of which represents an efficiency in rapid cutting operations greatly superior to its predecessor. The first stage, that of the use of the simple carbon tool steel, ended with the discovery by Mushet (about 1870) of his air-hardening steel, which was a high carbon steel containing tungsten with manganese or chromium or both. Mushet's steel was superseded in the third and present era by a low carbon steel with a tungsten content two to three times as great and containing also chromium. This steel was developed along with the high-heat treatment discovered by Taylor and White (about 1900). Shortly after this important step (about 1905), vanadium was introduced in the steel as a relatively large addition and with a considerable increase in its efficiency. The resulting product is now called modern high-speed steel.

The principal steps in the development of the lathe tool steels up to 1906 are illustrated by the following extracts from Taylor's data given in Table I.

FUNCTION. High-speed tool steel is used, as its name implies, for cutting metals and materials at high speeds with heavy cuts usually far in excess of those possible with carbon or finishing steels. The peculiar property which makes this possible is called "red-hardness" as the cutting surface may become heated to a dull red without impairing its cutting power. Its ability to make heavy cuts at high speeds renders it invaluable for quantity production. Besides being used for roughing operations, it is used to a great extent in tools for finishing where "red-hardness" is not so important, but hardness (in the sense of resistance to wear) and capacity for uniform hardening in large pieces is very essential. In fact, the tendency to use high-speed steel for almost every kind of cutting operation is probably carried to extremes.

COMPOSITION. Modern high-speed steel is a high alloy steel, the essential alloy contents of which are within the following limits: Carbon (0.50 to 1 per cent), tungsten (12 to 20 per cent), chromium (1.5 to 6 per cent) and vanadium (0.5 to 2 per cent). Other elements are of course always present as impurities or additions. While a number of compositions within the limits mentioned will furnish equally good steels, it does not follow that any combination within those limits will. The combinations found best by experience are placed on the market by the steel makers under trade names, all of which come within limits noted above and each of which is supposed to come within certain narrower limits as to composition.

The analyses in Table II are given by Mathews as representative of well-known commercial steels with their relative efficiencies as determined by Taylor's cutting test:

TABLE II. REPRESENTATIVE ANALYSES OF COMMERCIAL STEELS WITH THEIR RELATIVE EFFICIENCIES AS DETERMINED BY TAYLOR'S TEST

Efficiency per cent	C per cent	Si per cent	Mn per cent	Cr per cent	W per cent	V per cent
100	0.63	0.27	0.31	2.99	16.87	0.85
70	0.64	0.22	0.24	5.35	18.99	0.15
66	0.61	0.19	0.36	3.34	16.28	0.40
45	0.63	0.19	0.26	4.21	13.10	0.25

They do not represent as wide a variation in carbon as is often found. The analyses made at the Bureau of two standard steels show a considerable difference in carbon as well as other elements. See Table III.

TABLE III. ANALYSES OF STEELS MADE AT THE BUREAU OF STANDARDS

	C per cent	Si per cent	Mn per cent	Cr per cent	W per cent	V per cent
..	0.77	0.47	0.25	3.47	17.8	0.74
...	0.56	0.20	0.42	2.21	13.8	0.98

From the high-tungsten and other alloy content it is apparent that the price is very high. It is therefore in the interest of the user to give this steel the most careful and effective treatment possible.

SPECIAL FEATURES. High-speed steel has several unusual characteristics peculiar to it which are intimately connected with its treatment and utility.

(1) High-Temperature Treatment. It must be heated for hardening to an excessively high temperature, such as would ruin simple steels, to obtain its best properties. This treatment necessitates somewhat special equipment for producing the desired heat-treatment conditions.

(2) Red-Hardness. After being given the high-temperature treatment, it will not lose hardness on tempering until heated above a dull red heat. This is its most valuable characteristic, and its superiority over carbon tool steel, for cutting where high temperatures will be developed, may be clearly seen from the fact that the carbon steel begins to lose hardness appreciably on tempering at 200 deg. C. (392 deg. F.), while for high-speed steel the loss begins at about 700 deg. C. (1,292 deg. F.). Such temperatures for a given

TABLE I. PRINCIPAL STEPS IN DEVELOPMENT OF LATHE TOOL STEELS UP TO 1906

Date of Test	Compostion C	Mn	Cr	W	V	Cutting Speeds Medium Steel Forging	Hard Steel Forging	Hard Cast Iron	Remarks
1894	1.05	0.19	....	....	....	16 ft.	6 ft.	15 ft., 6 in.	Jessop carbon steel
1898	2.40	1.90	0.49	5.62	....	26 ft.	8 ft., 6 in.	28 ft.	Mushet (self-hardening)
1906	1.43	0.23	1.86	84.0	....	61 ft.	19 ft.	39 ft.	Bethlehem (self-hardening)
1906	0.74	0.06	3.86	16.2	....	91 ft.	40 ft.	50 ft.	High-speed steel
1906	0.68	0.07	5.95	17.8	0.32	99 ft.	41 ft., 6 in.	52 ft.	High-speed steel

$\frac{1}{8}$ in. depth of cut; $\frac{1}{16}$ in. feed; duration of cut 20 minutes.

loss in hardness indicate roughly the red-hardness quality.

(3) Secondary Hardening. The hardness of high-speed steel may be increased over that resulting from the high-temperature heat treatment by tempering within certain temperature limits which are relatively high. This property is made use of to obtain slightly higher lathe efficiency and to relieve hardening stresses.

(4) Self-Hardening. High-speed steel has the characteristic of hardening on cooling in air. This feature is important as it permits the uniform hardening of large tools and the use of less drastic quenching media than required for some tool steels. The chromium content is probably responsible in a large degree for this characteristic, though some of the other elements undoubtedly contribute to it.

EFFICIENCY TESTS. The test usually employed for determining the efficiency of a given tool steel is that developed by Taylor for lathe roughing tools and consists of determining the cutting speed, other variables being constant, for which the steel will fail or be ruined in 20 min. Taylor measured the time from the start until the tool was ruined, that is, the point completely worn off. Present testing practice is to take the time at which the tool fails, that is, loses its edge and a glaze appears on the metal being cut, for this gives a sharper end point, more consistent results and the tool may be more readily reground. The lathe test is often used to determine the efficiency of a steel for cutting conditions radically different from those in the lathe test and while in this case a fair estimate of its efficiency may be had, the final criterion must of course be its behavior under conditions approximating those of actual operation.

On account of the expense of the lathe or other full-size tests to destruction, experiments have been conducted to find, if possible, a relation between the cutting efficiency and some simple and quick test on the hardened steel. No such relation has been found for hardness, microstructure and magnetic properties. This is obvious from the nature of the property in question, that is, resistance to softening by tempering. Any test of this character will have to be made on the steel tempered above the secondary hardening range so that the progressive loss in hardness, or a parallel property, can be measured and compared for different steels. The value of this test is yet to be determined.

HEAT TREATMENT. It is essential to heat high-speed steel very slowly to a cherry red, about 750 deg. C. (1,382 deg. F.), before heating to a higher temperature in order to prevent cracks and checks. Above this temperature it may be heated as rapidly as desired.

Forging is best carried out at a relatively high temperature, not below 1,000 deg. C. (1,832 deg. F.). Cooling from the forging temperature should be slow enough to prevent hardening, otherwise cracking is likely to occur. Hardening (cooling in air or a faster medium) produces a maximum hardness and accompanying brittleness when starting from the forging temperature range, hence the tendency to crack. It is therefore well to cool in the heating furnace, in lime, ashes or any medium which will retard the cooling rate sufficiently. This phase deserves particular attention, as cracks formed in the process of forging are very likely to remain indistinguishable until grinding, the fault thereby being attributed to the subsequent operation.

For hardening, the heating of high-speed steels demands a very high temperature (1,200 to 1,300 deg. C. or 2,192 to 2,372 deg. F.), which is just short of fusion. The production of such temperatures requires somewhat special equipment, which, in the form of gas- and oil-fired furnaces, is placed on the market under the caption "High-Speed Steel Furnaces." These furnaces often have an accessory heating unit for preheating.

For work in which the preservation of the surface is no object, such as roughing tools, the hardening temperature is often judged by Taylor's method of heating until the surface fuses. This is, however, impossible in the case of shaped tools, and pyrometric control is then essential.

Platinum thermocouples are necessary for measuring the high temperatures involved and should be well protected by porcelain tubes. Optical and radiation pyrometers may also be used, but their inherent disadvantages must be considered in applying them to production work.

Time of holding at a given temperature is as important as the temperature, so that for efficient production the pyrometer should be supplemented by a clock, the time and temperature for a given tool and composition being specified to the hardener.

Protection of the surface is always desirable, and in some cases may effect a considerable reduction in machine work. Damage to the surface may be prevented in the furnace to a large extent by heating with a yellow flame or packing in a carbon mixture. Some oxidation will, however, occur on transference of the tool from furnace to quenching bath. Oxidation from this source may be prevented to some extent by heating in barium chloride or by covering the total with a paste such as is used by file makers. In general, slightly carburizing conditions are essential, or a very short exposure at the high temperatures.

High-speed steel is essentially an air-hardening steel when used in small sizes, but is generally quenched in oil, probably to avoid oxidation while cooling. Quenching in water at ordinary temperatures will almost invariably crack the steel, but water at 100 deg. C. (212 deg. F.) will probably give as good results as oil. Quenching directly in a lead or salt bath at the desired tempering temperature reduces the liability to quenching cracks.

It is generally recognized now that the best results are to be obtained by tempering for maximum hardness, that is, in the temperature range 550 to 620 deg. C. (1,022 to 1,148 deg. F.). The effect of tempering for secondary hardening is to increase slightly the cutting efficiency as measured by the Taylor 20-min. lathe test, but for shop cutting speeds its beneficial effect is undoubtedly magnified, initial hardness then being of greater value.

For tools requiring constancy of dimensions, tempering is necessary, as otherwise heating in service will produce changes in size.

CAST HIGH-SPEED STEEL. Many attempts have been made to avoid waste in machining by casting to shape. It is quite possible to make even intricate castings successfully, but there are several difficulties which limit its development. It is first of all necessary to refine the coarse casting structure and this is most readily done by forging or other hot working. As casting to shape precludes hot working the refining

must be done by some other method. Proper annealing will accomplish this, but whether to as satisfactory a degree as forging remains to be determined. In making castings there is always waste in the gate and risers, which non-useful metal, in the case of small castings, may be greater than the shape being cast. This method will therefore probably find its most profitable application only in the production of large or specially shaped tools.

SUBSTITUTES. The high price of high-speed steel has brought forth a host of substitutes, most of which replace tungsten with chromium or molybdenum in the presence of one or more other alloying elements. These are inappropriately called high-speed steels for their efficiency is much less than that of the high-tungsten high-speed steel, but they evidently have a field of usefulness. For finishing work or intermittent cutting where a high degree of "red-hardness" is not so essential, they may compete favorably on a price basis with the high tungsten tools which are regularly used. It must be remembered also that they may require a different and more exacting treatment than the high tungsten steels.

Besides the steel substitutes, there are non-ferrous alloys which may be considered as substitutes and are very successfully used in competition with high-speed steel for certain classes of work, particularly for cutting very hard material and for roughing. They are brittle and therefore cannot be used where subject to shock and must be used in short lengths. Tools must be ground to shape and no heat treatment is possible or necessary.

The principal alloys of this class are sold under the trade name of stellite. They are binary, ternary or quaternary alloys composed of either cobalt or nickel and metals of the chromium group, which group includes chromium, tungsten, molybdenum and uranium; the latter, however, has not been used commercially in the alloys. The stellite alloys may be broadly divided into two classes: (1) Those malleable at a red heat, and (2) those which can be worked into the desired form only by casting.

The malleable alloys are composed almost entirely of cobalt and chromium, varying from 10 to 50 per cent chromium with a corresponding cobalt composition. These alloys, which are resistant to nearly all forms of corrosion except hydrochloric, sulphuric or hydrofluoric acids, are used for tableware, surgical instruments, chemical and laboratory apparatus and jewelry. Patent specifications Nos. 873,745 and 873,746, dated Dec. 17, 1907, describe the methods of manufacture of these alloys and give the uses and properties of alloys of various compositions. Patent No. 1,150,113, dated Aug. 17, 1915, describes similar alloys using iron as a third constituent.

The cast alloys are either ternary alloys of cobalt chromium and tungsten or molybdenum; or quaternary alloys of cobalt chromium, tungsten and molybdenum. The compositions and manufacturing methods of these alloys are described in patent specifications Nos. 1,057,423 and 1,057,828, dated April 1, 1913.

Another alloy of similar type is Cooperite. The patent specifications call for the following composition: zirconium, 8 to 15 per cent; nickel, 50 per cent or more.

Sulphur in Cutting Lubricant for Monel Metal

BY JOSEPH MANCUSO

Monel metal is coming into popular use in the arts, but many automatic screw-machine operators find difficulty in machining it. The following is a description of the method used by Wallace & Tierman Co. in the manufacture of monel-metal parts with the B. & S. Automatic Screw Machine.

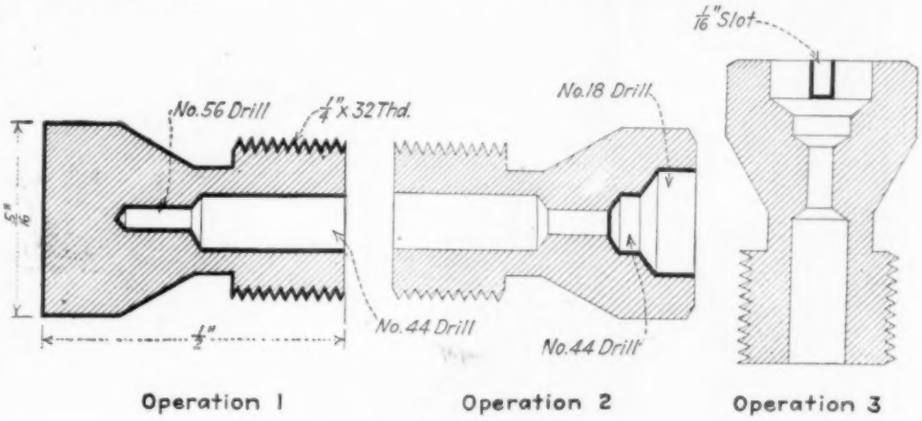
Part No. P 9 is taken as an example as it required forming, drilling and threading operations.

Operation No. 1—Automatic Screw Machine.
Operation No. 2—Hand Screw Machine.
Operation No. 3—Slot.
Spindle speed to form—1093 r.p.m.
Spindle speed to drill and cut off—1093 r.p.m.
Surface ft. per minute for forming and cutting off—89.5.
Surface ft. per minute for No. 44 drill—24.6.
Surface ft. per minute for No. 56 drill—13.3.
Spindle speed to thread—419 r.p.m.
Surface ft. per minute for threading—27.5.

Production 685 pieces per 8 hours; 675 pieces threaded without changing or sharpening die.

High-speed tools are used where possible, such as forming, turning and cutting-off tools, with carbon-steel drills and thread dies. All tools are ground with the same rake and clearance as for steel.

The cutting lubricant used is mineral cutting oil, five gallons of which is thoroughly mixed with 2 lb. of flowers of sulphur (which can be purchased at any drug store for 10c. per lb.). This mixture will give the oil a yellow color and will deposit the sulphur powder very noticeably upon the tools. The sulphur powder does not go into solution with the oil but is held in suspension and the bottom of the oil tank should be stirred every hour or so to prevent the sulphur from settling. This sulphur and oil mixture has been in use on monel-metal work for several years, without any harmful effect on any part of its machinery, except a discoloration of the bronze gibs of the tool slides and these are removed and cleaned from time to time. The whole success of this stunt is in the sulphur powder and it is necessary that the tools receive a generous supply of this mixture.



OPERATION SHEET

The Foote-Burt Piston-Turning Machines

By J. V. HUNTER
Western Editor, *American Machinist*

The machines herein described show to what an extent engine-manufacturing machinery has been developed. The particular features of this line of piston-turning machines are compactness and speed of operation.

PISTON-TURNING machines which have been especially designed for the purpose of affording large production in a relatively small floor area are among the productions of the Foote-Burt Co., Cleveland, Ohio. Each machine consists of a row of vertical spindle lathes mounted on a common base, two-spindle and four-spindle types being made. The function of the machine is to turn and groove the outside surfaces, and to face and center the upper ends of pistons. This work is performed in two operations. It is customary to use two machines on the job, one for the roughing and the other for the finishing operation. Fig. 1 shows a four-spindle, or four-column, machine with pistons in position on the spindles.

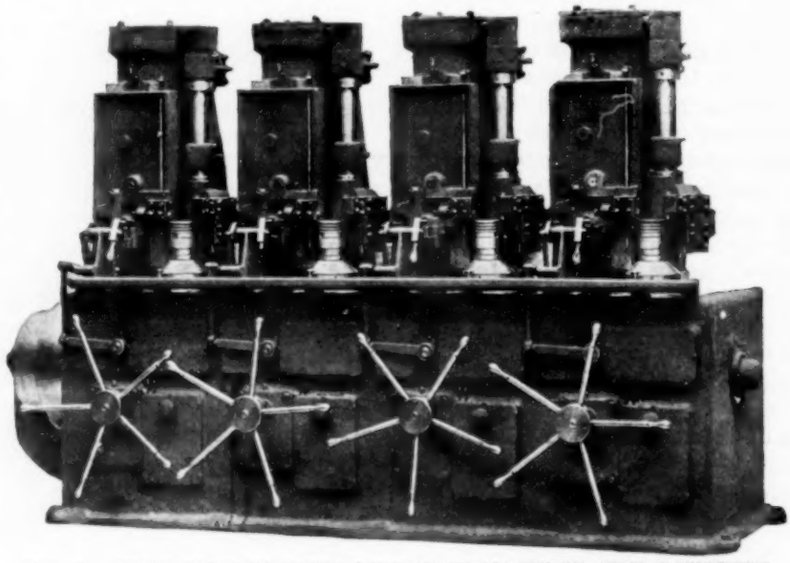


FIG. 1. FOUR-COLUMN PISTON-TURNING MACHINE FOR ROUGHING

Each spindle is entirely independent in its action, so that a delay or even a temporary shutdown at any one station, such as occurs while re-cooling, does not in any way interfere with the operation of the other spindles of the machine. The pistons are removed and replaced at each station by the operator as fast as they are completed; and, although all spindles are driven from the same power source, there is no timing connection between the different units other than the constant rate of drive, as their operating functions are all self-contained. The work-holding chucks vary somewhat with the type of piston being worked but all have draw-in bars with a loop which goes inside the piston and serves to draw down on a short pin passed through the wrist-pin hole. The draw-in bar is operated by the large pilot wheel in front of each station.

A better view of the toolposts for the roughing machine is shown in Fig. 2, although the design is not identical with that shown in the preceding illustration. The side-turning tool *A* is carried in a clapper-box *B* mounted on the slide *C*, which feeds vertically downward on the column. The clapper-box is controlled by stops

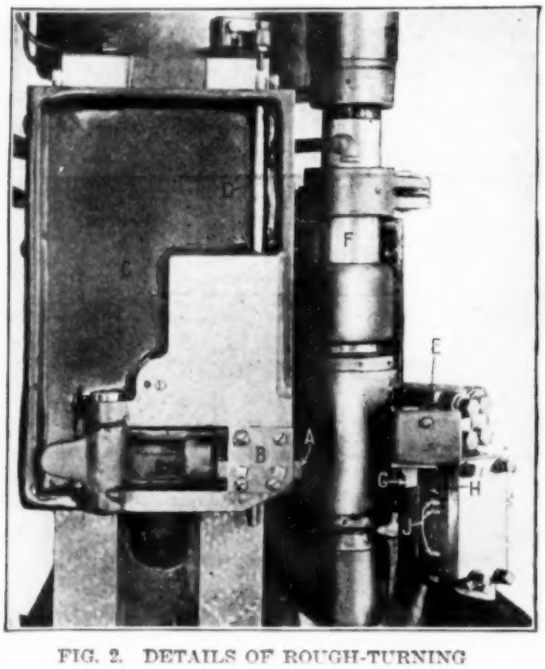


FIG. 2. DETAILS OF ROUGH-TURNING

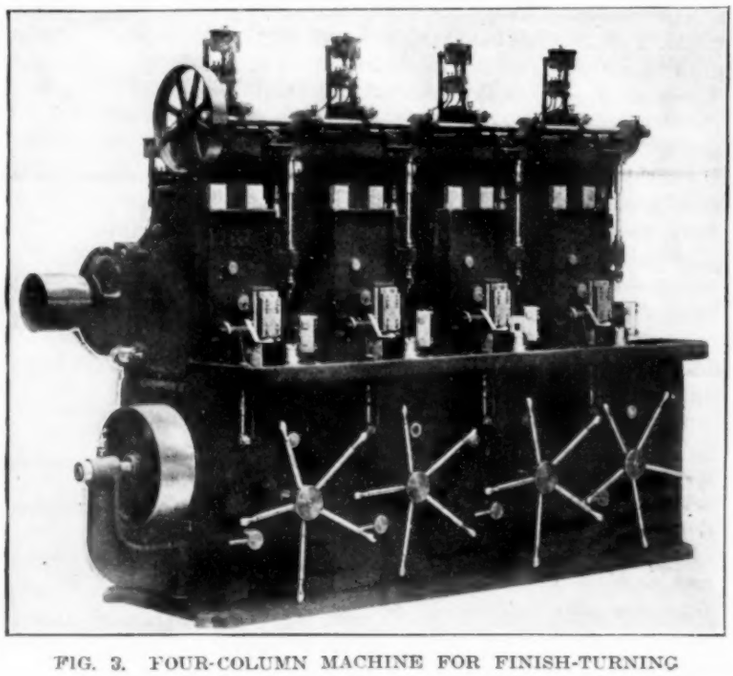


FIG. 3. FOUR-COLUMN MACHINE FOR FINISH-TURNING

on the rod *D*, and it is thrown out during the return travel of the slides so that the tool clears the work. The other tools are on a bracket arm *E* which swings about the shaft *F* and is controlled by a cam and lever motion. The tool *G* faces the top of the piston; as it nears the center, the tool *H* chamfers the upper corner, and then the grooving tools *J* enter the work.

In the roughing machine the work runs at a speed of 50 ft. per minute. The feed is controlled by a cam motion, and to provide for rapid motion of the tool through the clearance, both to and from the work, the feed is at high speed, for $\frac{7}{8}$ in. of travel. A feed of 0.035 in. per revolution is generally used, but the rate of feed is governed by what the job will stand, as the

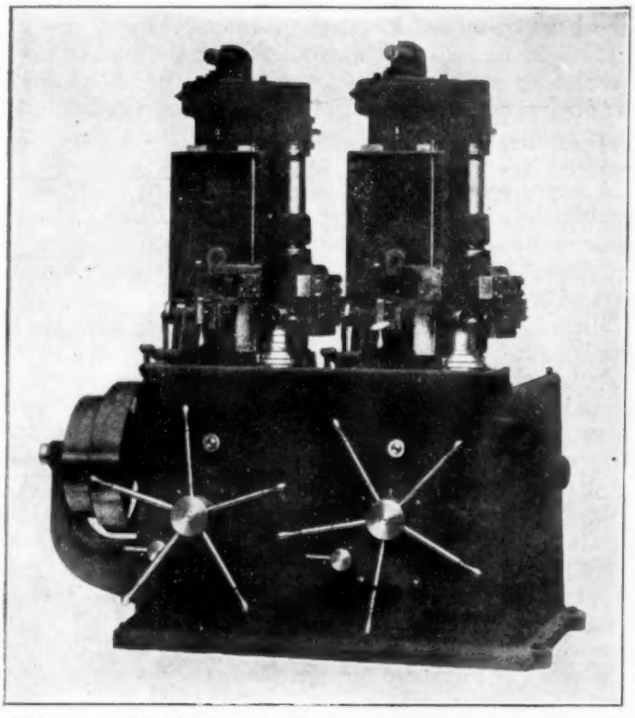


FIG. 4. TWO-COLUMN MACHINE FOR ROUGH-TURNING

tools can usually greatly exceed this rate. In some cases it is, therefore, possible to considerably increase the rate of production by speeding up the machine.

The Finishing Machine

The four-spindle finishing machine, Fig. 3, has no clapper-boxes to hold the turning tools, three of which are carried in each slide. The lowest tool finishes the body and skirt of the piston, and as it nears the bottom the two upper tools reduce the diameter of the space between the ring grooves. A cutting speed of 100 ft. per minute, with a feed of 0.035 in. per revolution, is used. The total travel of the tool is $5\frac{3}{8}$ in., and of this $\frac{7}{8}$ in. is fast feed through the clearance space and the remainder slow feed for cutting.

The operation of the swinging arm carrying the grooving tools is similar on both the finishing and the roughing machines. The finishing machine has, in addition, a light spindle which carries a centering tool, and which is driven from a cross-shaft on the top of the machine through a pair of bevel gears. This spindle slides through a splined bushing in the upper bearing, and it is guided and fed by a bracket attached to the tool slide.

The two-piston turning machine, Fig. 4, is practically the same in mechanical design as the larger machines, the one shown being intended for roughing operations. Each column has a small housing on top holding a quill, which is used to adjust the position of the vertical slide. The short-handled lever at the left of each column controls the clutch for that station of the machine, and it is arranged so that it is automatically disengaged when the slide returns to the upper end of its travel. An unturned piston may then be put in the place of the finished one.

Engineering Foundation Seeks Large Endowment

Based on the generous gifts and high purpose of Ambrose Swasey, the Engineering Foundation has, since 1915, maintained a liaison between engineers, as represented by the Founder and other societies, and scientific workers, as presented in the National Research Council. Practical means for co-operation in research have been set up so that engineers in the numerous branches of the profession may join with physicists, chemists, geologists, geographers, psychologists, doctors, biologists, educators and anthropologists, in the attack upon problems of common interest and in the exchange of knowledge.

Potential benefits for the whole nation are very great, but these benefits cannot be gained without expenditure of effort and materials. Research workers must be supported. Equipment, materials, working places and traveling facilities must be provided. Since the benefits accrue to the professions, the industries and the public in general, support in large measure should come from general funds, such as those provided by endowments. Although engineers, like other professional men as a class, are not wealthy, some individual engineers have large means. The Engineering Foundation seeks to build up its endowment to dimensions worthy of the profession. Engineers connected with industrial and financial organizations having great resources can aid by convincing proper officials of corporations that the continued prosperity of our industries depends upon continued progress of research. Since the commercial and industrial establishments of the country reap the larger proportions of the financial profits arising from scientific and technological work, these establishments should contribute liberally to the support of research.

Scientists are more largely concerned with research in pure science, the search for undiscovered knowledge for its own sake, the usefulness of which may not become apparent, in some instances, for many years. Between this most advanced line and the development of specific industrial devices or processes lies the large field of research in applied science and the industries which especially concern technologists. In this broad field there is scarcely an item of work in which the engineer, in some branch of his practice, is not directly concerned. Sooner or later the engineer uses all the results of research in science and the industries to advantage.

There are many problems relating to the materials and forces of engineering on which further knowledge is needed. Progress will be made approximately in proportion to the funds made available. But there are other kinds of problems which concern the engineer.

No longer may one declare, as did Professor J. B. Johnson, a generation ago, that "Engineering differs from all other learned professions in this—that its learning has to do only with the inanimate world, the world of dead matter and force." Many acute social and economic questions of our day need the dispassionate, impartial, patient study of scientists and technologists.

To these questions must now be applied the scientific method of collecting facts by thorough study and the engineer's capacity for planning and performing, instead of ill-considered "reforms."

Engineering works, public, corporate and private, frequently involve studies of special problems or in themselves constitute full-sized experiments, which could be made to yield important data for general technical use. Sometimes the engineers in charge do not perceive the opportunity, not having been trained in research work. More often the possibilities are realized, but means, men and time are not available because of the urgency for completing the project with a minimum expenditure, in the shortest practicable time.

Occasionally experimental work is undertaken in accordance with a well-conceived plan, as a necessary or desirable adjunct to the main operation. In such cases the exigencies of the main operation sooner or later interrupt the experimental work; the men who have it in hand leave the force; the information is gained, but never written up; the statement is buried in some report of limited circulation; or greater familiarity with research methods and a broader conception of the problem could, with small additional expense, have secured much more valuable results and have made them more generally useful.

Again, many construction or manufacturing operations might be made to yield useful data of greater value than those obtained from small-scale laboratory experiments, if only trained observers with suitable instruments were provided. Often the expense would be slight. Sometimes for lack of trained observers occurrences of scientific significance pass unnoted.

The services described in the foregoing paragraphs, and many others, could be performed by the Engineering Foundation, if adequate funds could be placed at its disposal. The Foundation does not plan to build laboratories and conduct research work directly, but rather to stimulate, co-ordinate and support research work in existing scientific and industrial laboratories, co-operating, in so far as may prove advantageous, with the National Research Council.

Mr. Charles F. Rand, of 71 Broadway, New York, past-president of the United Engineering Society, and of the American Institute of Mining and Metallurgical Engineers, was elected chairman of the Engineering Foundation, on March 19, to succeed Dr. W. F. M. Goss, resigned. With the collaboration of Mr. Swasey, Mr. Rand is actively seeking additions to the endowment fund which will swell the total to at least a million dollars in the near future. Mr. Swasey's gifts amount to $300,000.

The office of the Engineering Foundation is in the Engineering Societies Building, 29 West 39th St., New York. Further information may be had by addressing that office, or the chairman. A booklet giving an account of the Engineering Foundation and its work will be mailed upon request.

What Is a Machine Tool?

By L. L. Thwing

If I am not mistaken, Mr. Jansson's definition of a machine tool, which appeared on page 1044 of the *American Machinist*, was suggested by that journal some years ago. In any case it is on the whole the best descriptive definition we have.

If it presumes the delivery of such materials as castings, forgings, etc., it would exclude all forging, swaging, and forming (by pressure) machines, also patternmaker's lathes and all sheet-metal machinery. And is it not true that a man who might be a skilled operative of any or all of these machines could hardly be called a machinist, while on the other hand the usual requirements for an "all-around" machinist do not include experience on any of the above machines.

It might be said that specialists such as a grinding-machine or screw-machine operators could not qualify as "all-around" machinists either, and they cannot, but they have had a definite experience in metal cutting, and that is the basis of the machinist's art.

A recent contributor has asked how many present day machinists could handle the valve of a 1,000-lb. steam hammer in a confidence-inspiring way? Probably very few, but the majority will vigorously deny that it is any part of their trade.

Since the days of ancient Greece men who have used words to indicate certain actions or certain things have disputed about their meaning, but they have generally agreed that if a word is in common and every day use by people who have frequent occasion to use such words, such use is correct, whether or not they are backed up by derivation, ancient authority, or literal exactness.

In the early days of the machine shop, such terms as turning lathes, drilling machines, and planing machines were in universal use, so that ancient authority is not lacking for those who advocate the use of these terms today; however the terms "drill" and "planer" have become a fixed part of our shop language and, despite what may be advanced against them, they will probably continue to be so used.

If, as a matter of fact, a majority of machinists and machine-tool dealers call sheet-metal machinery "machine tools," the question is definitely settled in a practical way.

An excellent example of the application of the recently suggested definition—"a machine tool is a metal-working machine whose waste is in the form of chips,"—is shown when it is applied to a machine recently advertised in this magazine. The machine is a spinning lathe with a tool for truing up and smoothing the edge before removing from the lathe. Under the above definition this is a machine tool; remove the turning fixture and it produces no chips and is therefore a metal-forming machine.

Too Much Legislation

The present campaign on the part of certain interests to bring about the adoption of the metric system by legislation brings to mind the story of the action of a certain legislature in the olden days in its efforts to simplify and improve the order of things. Having had brought to its attention the incommensurate relation of the circumference to the diameter of a circle a vote was passed to the effect that in the future, the circumference should be three and one-seventh times the diameter.

A Few Splitdorf Details—II

BY S. A. HAND AND K. H. CONDIT
Associate and Managing Editors, *American Machinist*

AS WAS stated in the first article on Splitdorf magnetos, the rotor used is entirely different in many respects from that used in most other types of high-tension instruments. Instead of the primary and secondary windings on a soft-iron frame, the Splitdorf has four drop-forged wings riveted to a brass center section into which are screwed the steel shaft ends. An assembly drawing of the rotor is given in Fig. 7. The wings are end-milled and pack-hardened, 12 pieces being set up for milling at once. Clearance holes for the shafts are then drilled and also the holes for the rivets which fasten the wings to the brass center. The various parts are assembled and the brass rivets at *A* and *B*, Fig. 8, and the iron rivets at *C* and *D* are inserted. The rotor is next put in an Eveland arc riveting machine as shown in Fig. 8. In this machine the rivet is heated by the electric current and forced into the countersunk hole in the wing by a downward movement which is operated by a lever acting through a rack and pinion. This method is quick and avoids the distortion likely in hand or machine riveting. It also fills the holes better.

The severe conditions under which ignition magnetos must operate make rigid inspection a necessity and consequently the makers of the Aëro have developed some ingenious devices for testing the accuracy of the various sub-assemblies. These are described here and also the processes and dies used in the molding room where the insulating parts are manufactured.

(Part I was published in our last week's issue.)

The rotor is then passed through several turning, milling and keyseating operations and finally has the circumference of the wings and both ends of the shaft ground to size.

INSPECTION OF ROTORS

To facilitate the inspection of the rotors the fixture shown in Fig. 9 was made up. Perfect performance of the magneto requires that the distances between the two shaft shoulders, the two wing faces and the respective shaft shoulders and the adjacent wing faces be held to close limits. The inspection fixture has three pointers which read to thousandths of an inch, plus or minus, and give an accurate check on the various distances mentioned. The rotor rests in two supports with the left wing face against the fixed support *A*. The movable fork *D* operates the pointer *C* and indicates any error in the distance from the shaft shoulder to the wing face. The movable fork *D* operates the pointer *E* and indicates any error in the distance between the two wing faces. Similarly the fork *F* operates the pointer *G* and measures the distance from the left wing to the right shaft shoulder. If those three distances fall within allowable limits it follows that the first distances mentioned are also correct.

A FIXTURE FOR TESTING CONCENTRICITY

Another ingenious inspection fixture is shown in Fig. 10. This device is used for testing the concentricity and also the distance from the face of the flange to the bottom of the recess which takes the shoulder on the rotor shaft just described, in the bearing holder assembly. A number of the finished assemblies, driving end, appear in the upper right-hand corner, and a breaker end assembly will be seen in the upper left-hand corner and in detail in Fig. 11. For smooth running the rotor shaft must be concentric with the small shoul-

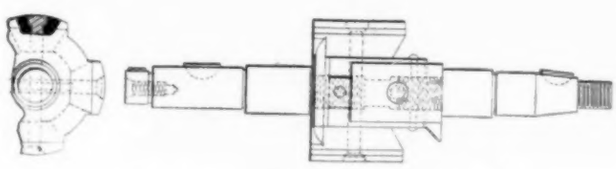


FIG. 7. MAGNETO-ROTOR ASSEMBLY

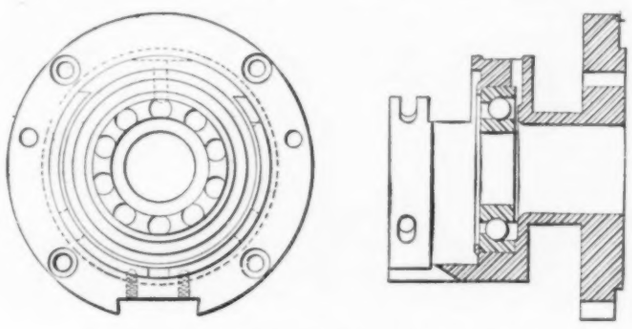


FIG. 11. BEARING-HOLDER ASSEMBLY

AUTOMOTIVE CONSTRUCTION

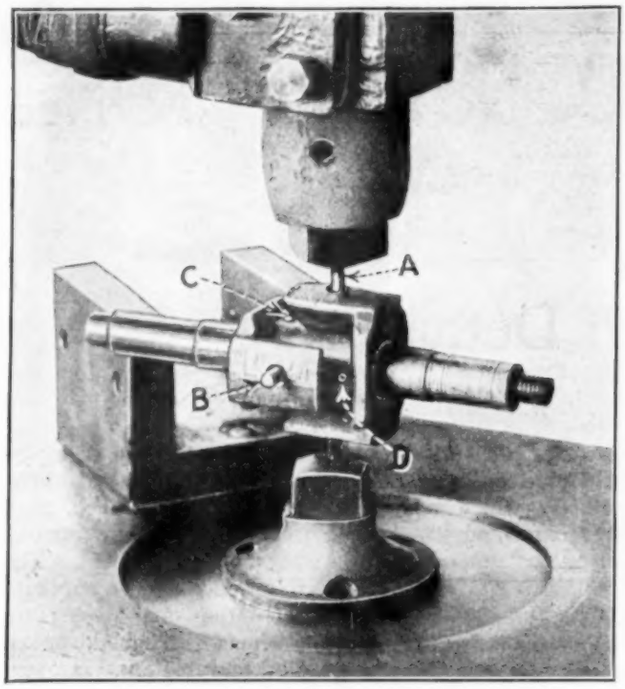


FIG. 8. RIVETING THE ROTOR WINGS

der at the right of the sectioned view in Fig. 11. Consequently, the inner ball race must also be concentric and its face must be a specified distance from the face of the shoulder.

How the Concentricity Is Determined

The bearing holder is shown in position at *A*, Fig. 10, with its flange against the upright *B* and held by the swinging clamp *C*. The hardened test plug *D* is then inserted through a hole in *B* until it enters the inner ball race up to a shoulder. The other end enters a recess in the movable upright *E* and engages the wedge-shaped block *E* which supports the "go" and "no go" levers *G* and *H* and is moved horizontally by the leved *K*.

The illustration shows a perfect holder in the block as indicated by the fact that with the block *E* moved to the right the "go" lever has dropped and the "no go" lever is supported. The concentricity is determined by spinning the test plug which is so de-

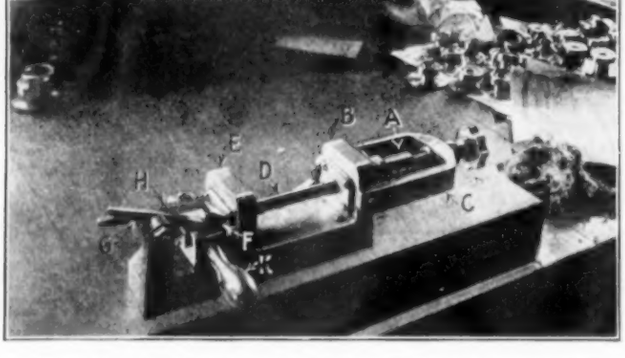


FIG. 10. BEARING-HOLDER INSPECTION FIXTURE

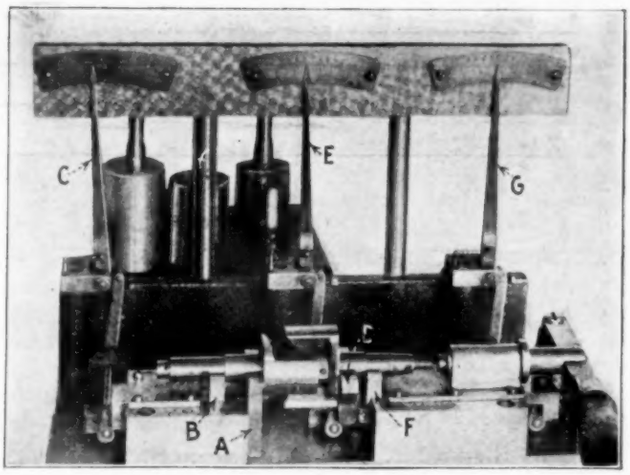


FIG. 9. ROTOR-INSPECTION FIXTURE

signed that a very slight eccentricity of the bearing will cause it to bind.

The need for extreme accuracy in this part of the magneto is apparent when one considers the use and abuse to which it is subjected. In many cases these bearings have to run for months without lubrication as a result of carelessness of the operator of the car or truck to which the instrument may be attached.

Making Cam Blanks

To get the best results out of any magneto it is essential that the break or interruption of the primary current occur exactly at the theoretically determined point in the cycle of operations. The breaker cam is the part responsible for this action and its contour must be held to very close limits. The Aëro cams are cut from a round bar of 0.20 carbon steel in an automatic screw machine which also drills and reams the central hole preparatory to the cutting of the keyway on a small Lapointe broaching machine. The cam blanks thus formed after they have been straddle-faced are strung five at a time on an arbor and rough-ground to shape in a machine with a cam-grinding attachment that feeds

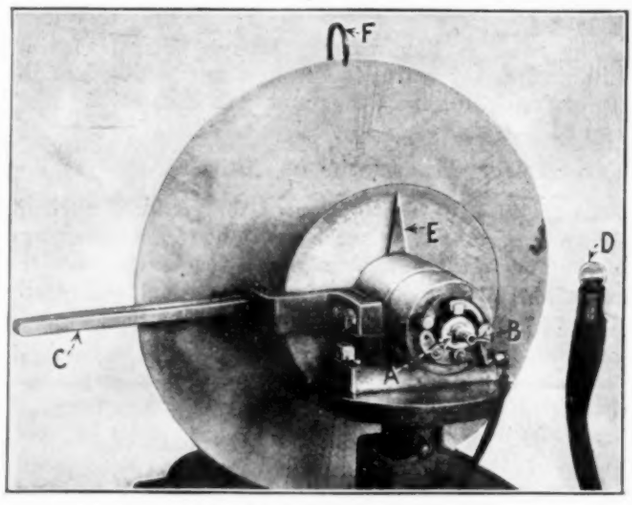


FIG. 12. CAM-INSPECTION FIXTURE

AUTOMOTIVE CONSTRUCTION

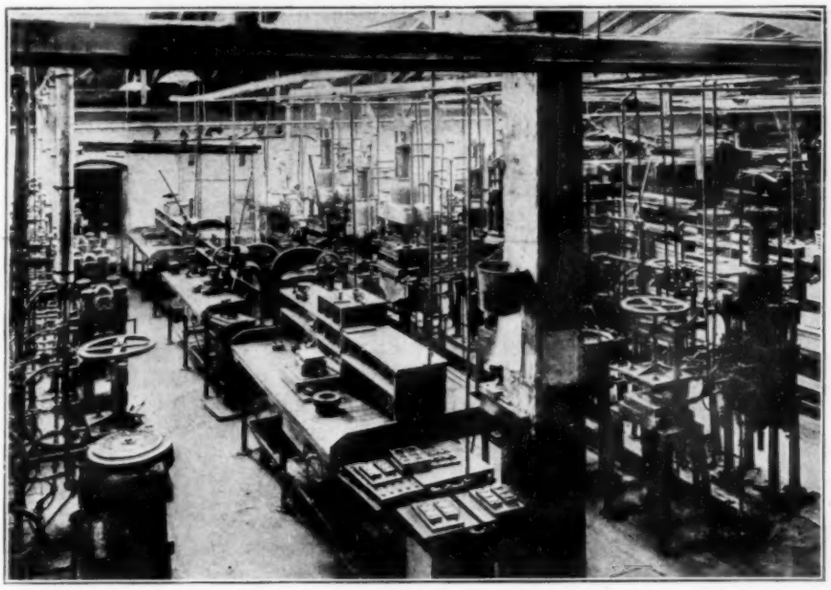
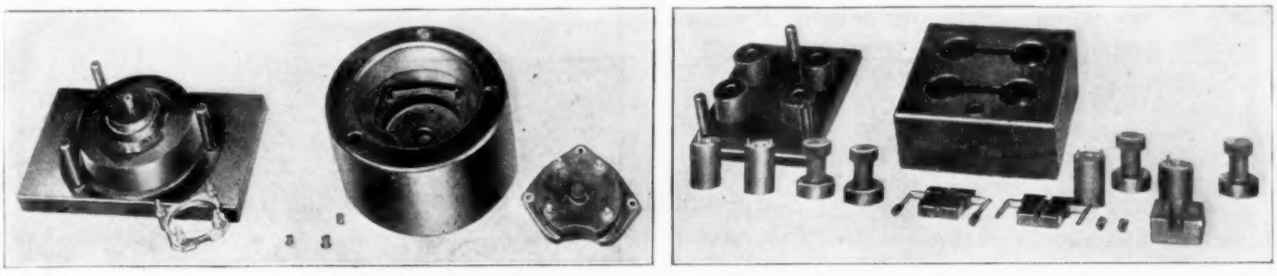


FIG. 13. GENERAL VIEW OF MOLDING ROOM

is held by a knurled nut and is readily adjustable for different tests. The indicator *F* is held by friction and can be pushed either way for adjustment. Each cam is tested for symmetry, point of break and duration of break according to the values given on the drawings.

Symmetry of the cam lobes and concentricity of the hole are determined by means of testing fixture carrying two Ames dials operated by fingers which slide on the cam surface, one near the top and the other near the bottom.

Because of the extremely high voltage of the current generated by a high-tension magneto, particular care must be exercised in the design and manufacture of the insulating material used. The Splitdorf Electrical Co. uses a good deal of Bakelite for making molded insulation, but where the



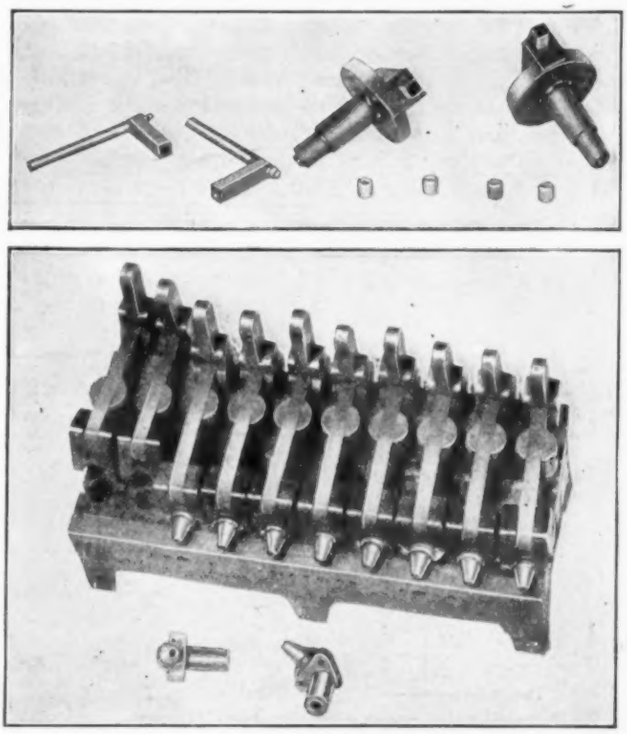
FIGS. 16 AND 17. DISTRIBUTOR PARTS AND MOLDS

the abrasive wheel directly into the work without traverse.

After rough-grinding, the cams are stamped with the proper symbol number and pack-hardened for 5 hrs. in Carbo X at a temperature of 1650 deg. F. They are drawn at 400 deg. and quenched in water. The scale is then removed on a disk-grinding machine and final grinding is done in practically the same manner as the rough-grinding except that a finer wheel is used which produces a finish almost equal to polishing. Finish-grinding limits are ± 0.001 in. on the lifting face.

Inspection of Cams

Inspection of the cams is made in the fixture shown in Fig. 12 where a motorcycle-type cam is shown in position for testing at *A*. The cam is slipped on a splined arbor *B* from which it is kicked off, after testing, by the lever *C*. A standard breaker-arm assembly is fitted to the fixture, the contact points acting as a switch in the circuit which contains the lamp *D*. Back of the fixed pointer *E* is a disk graduated in half degrees and locked to the cam arbor so that the zero point is under the pointer when the spline is vertical. The larger disk is graduated in degrees with the zero and 180-deg. points marked. Some of the divisions between 20 and 33 deg. are made longer and marked to indicate the particular cam which breaks at each one. This disk



FIGS. 14 AND 15. DISTRIBUTOR FINGER AND STRAIGHTENING FIXTURE

AUTOMOTIVE CONSTRUCTION

FIG. 18. CORNER OF GENERAL ASSEMBLY FLOOR

conditions are most severe it uses a compound of its own known as Americanite. This is a mixture of rubber, talc and several other ingredients which comes from the mixing rolls as a sheet of material looking not unlike dirty brown linoleum. It is used alone for certain parts and in combination with Bakelite for others, and was developed under the need arising from the cutting-off of foreign materials during the war.

A view of the molding room is given in Fig. 13 which shows the Greenard arbor presses used for stripping the molds, and the hand-operated Zeh and Hahnemann and hydraulically operated Burroughs presses for the actual molding. For this work a steam pressure of 110 lb. is used to keep the material at the required temperature (300 deg. F.) and a water pressure of 2,500 lb. for operating the power presses. The molding operation on Bakelite lasts 10 to 30 min., depending on the size of the piece, and 25 to 50 min. on Americanite. The raw Americanite stock is kept pliable on a steam plate until it is required. The molds are painted with liquid paraffin to prevent the "cookies" from sticking to the pan. Some of the molded parts with the inserts used and the molds in which they are made are illustrated in Figs. 15 and 17.

Fig. 18 shows a corner of the assembly floor where the magnetos are put together ready for testing. This gives a fair idea of the simplicity of the equipment and tools necessary for this work.

From final assembly the magnetos go to the testing jacks, Fig. 19, to undergo what is known as a "road test." Here they are run at maximum speed under conditions which simulate those of actual use as nearly as possible.

After this test the finish-inspection department puts the instrument through a rigid examination for defects of material or workmanship, checks for timing and runs the magnetos on an individual testing machine shown in Fig. 20 with gear guards removed. Here speeds of 100 to 3,000 r.p.m. are obtainable so that the spark-producing ability can be tested at any speed with facility, and a good idea can be obtained of the kind of performance to be expected from the magnetos in service.

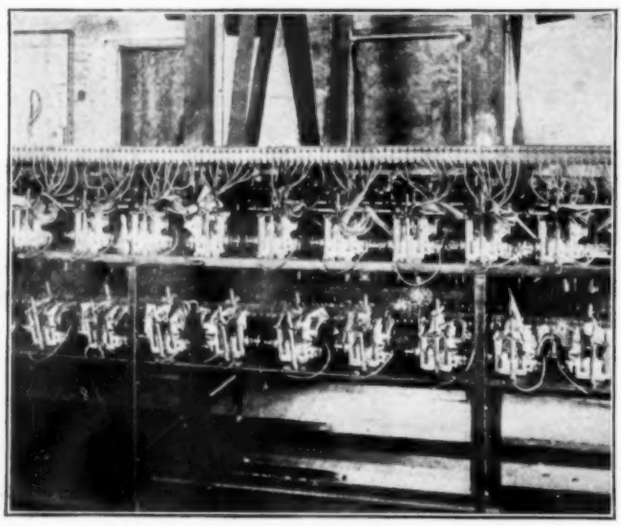


FIG. 19. "ROAD" TESTING JACKS

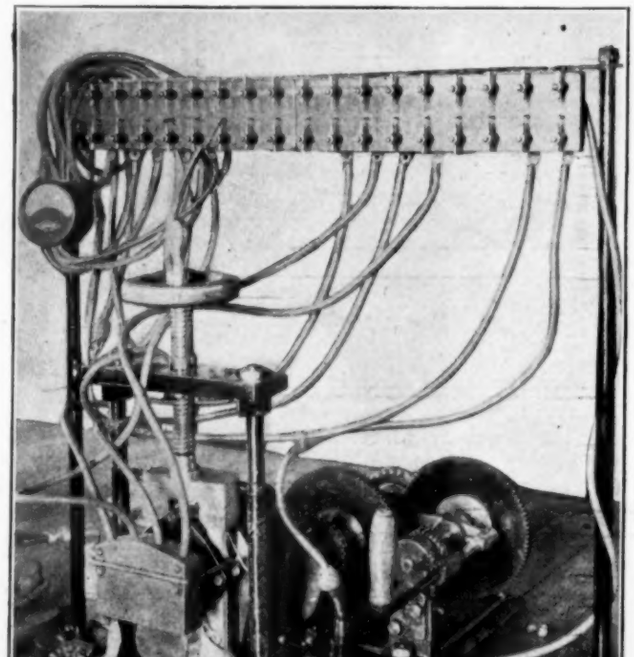


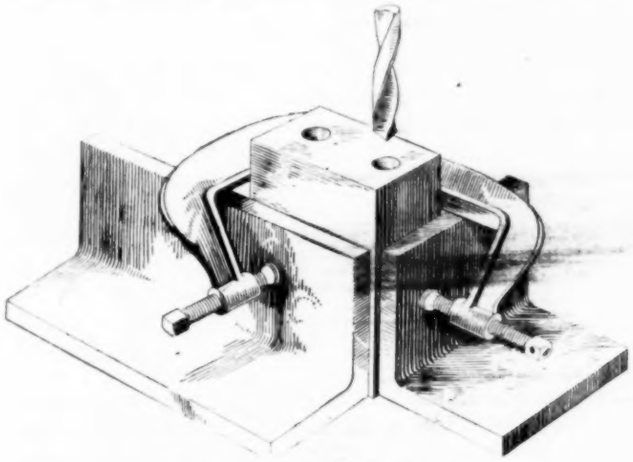
FIG. 20. FINAL-INSPECTION TESTING FIXTURE

Using Two Angle Plates to Clamp Work

By H. H. Parker

While the advantage of the arrangement shown in the sketch is obvious it is not always used; instead, when setting up square, rectangular, or other work of considerable relative height, on the drill press table, a single angle plate is used to which the work is clamped and then squared up in the other direction by trial.

By using two angle plates at right angles clamped to adjacent sides of the piece, the work is bound to be



USING TWO ANGLE PLATES

perpendicular with the table if the angle plates are accurate and no chips are lodged under them. Cylindrical pieces may be clamped in the same manner.

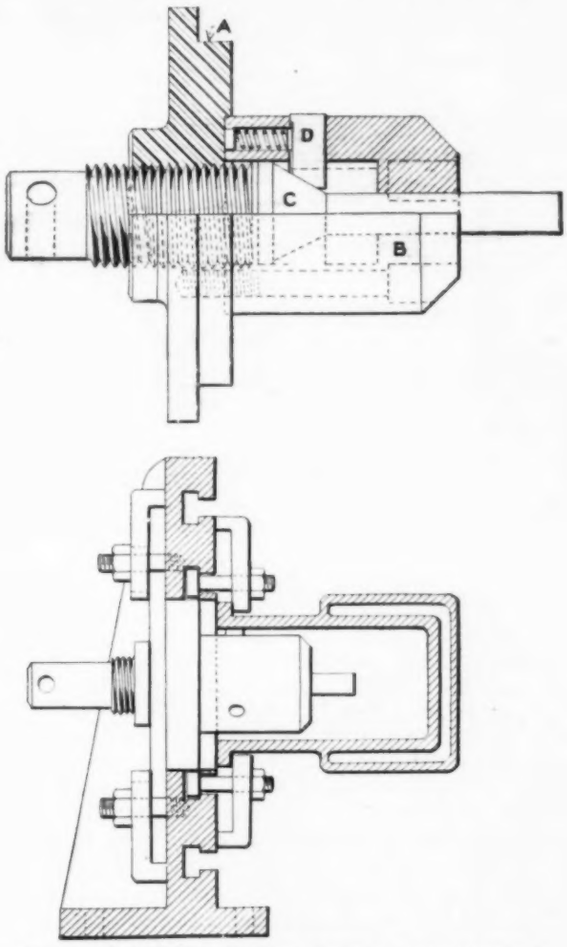
Whether the drill spindle is square with the table is another matter. The writer recalls one large shop where great precautions were taken to level up work on the drill press table but no steps were taken to ascertain if the drill spindle was perpendicular to the table —and generally it was not.

A Device for Centering Cylinders Preparatory to Grinding

By Roy F. Leighton

The illustration shows a device for locating an automobile engine cylinder on an angle plate in position for grinding. The angle plate is attached to the carriage of a large lathe and the boring and grinding attachments screw on to the spindle nose. This device will true up the cylinder at once and hold it in position while the block is being clamped to the plate.

The shoulder of the disk *A* fits the hole in the angle plate and the device is clamped to the latter with the nose piece *B* projecting through. A block is then swung



CENTERING DEVICE FOR BORING AUTOMOBILE CYLINDERS

into place with the cylinder fitting over *B* and the central screw of the device tightened by means of a pin in the cross-hole at the exposed end. Turning in this screw causes the tapered part *C* to expand the three hardened steel jaws *D* thus centering the cylinder and holding it until clamps have been applied. A coil spring and fiber disk pressing against a flat spot on each jaw prevent the lower ones from dropping of their

own weight and interfering with the locating of the cylinder. The nose piece *B* is held to the disk by long fillister-head screws and several sizes are provided to cover a range of cylinder bores.

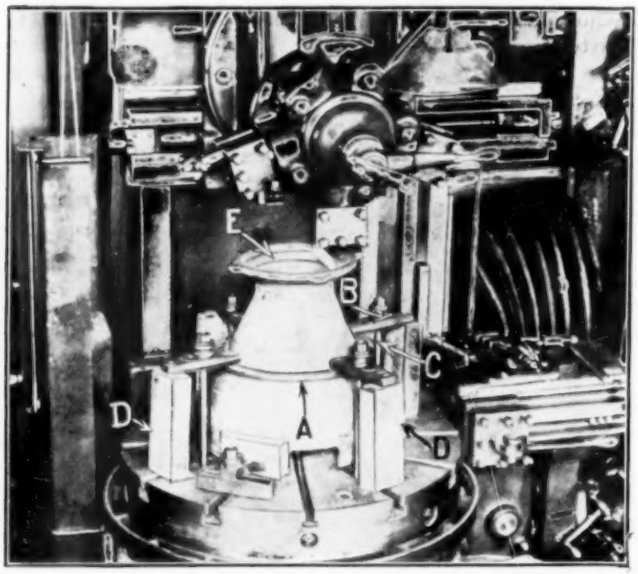
Clamping a Difficult Job on the Boring Mill

By E. A. Dixie

The illustration shows one of a number of conical hoppers which were to be turned and bored on a vertical boring mill. A job of this shape is not the easiest one to clamp securely on any machine but the method of holding it, as shown herewith, not only assures rigid clamping, but is simple and inexpensive.

The ring *A* was made by the blacksmith. Four straps *E* and bolts *C* are used in conjunction with the wooden packing pieces *D* to strap the hoppers securely to the table.

Another interesting feature in connection with this job is that the 45-deg. surface *E* was turned by throwing



CLAMPING CONES ON THE BORING MILL

in both the cross and the down feeds simultaneously. The machine used is a Niles vertical boring and turning machine.

Disk-Grinding Friction Rolls

By W. Burr Bennett

The cost of turning the outside diameter of a 3⅛- x 3-in. friction roll or pulley was considered to be too high, so it was decided to try a process of disk grinding. The latter method seemed doubly attractive, inasmuch as a more or less roughened surface was desirable to hold the cement used in securing the leather friction cover on the face. After some study it was decided to make a fixture such that the roll or pulley would be held at an angle on the face of the grinding disk, and a Gardner disk grinder with an 18-in. disk was selected as the proper machine. This machine has a table that can be swung in an arc across the face of the disk, thus distributing the wear on the cutting face, and it is also provided with a micrometer feed, which permits of close sizing.

ARRANGEMENT USED FOR DISK-GRINDING FRICTION PULLEYS

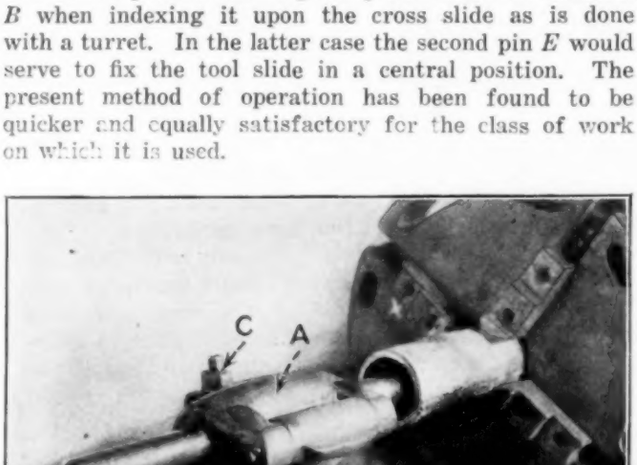
The shaft holes in the rolls are previously drilled and reamed. During the grinding operation the roll is kept in place by a collar, which is held on the extension of the shaft of the fixture by a loose pin. The work in place on the fixture is shown very well in the accompanying illustration. The average continuous production time on this operation is three rolls per minute, which is quite a contrast to the previous turning time of three to four minutes each.

Holder for Boring Bars

By J. H. Vincent

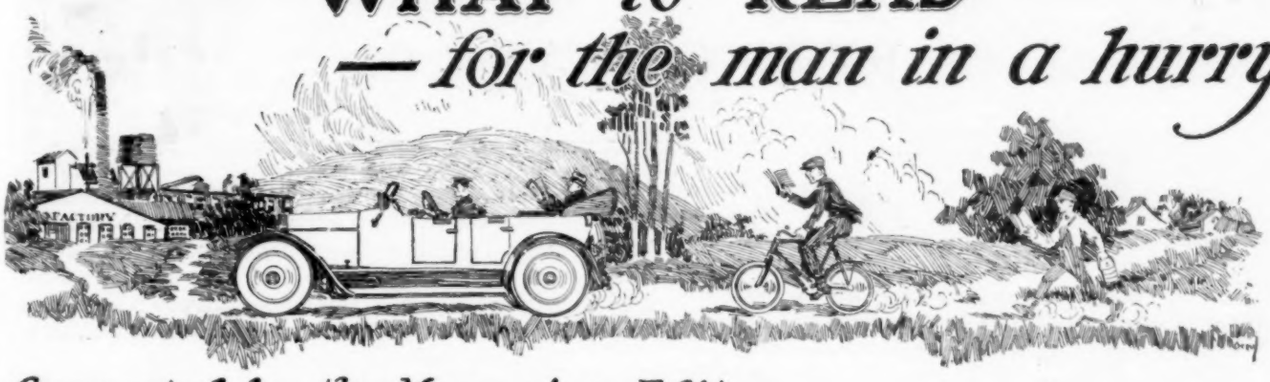
The device shown in the illustration is one which is in frequent use for holding boring bars in the shops of the Minneapolis Threshing Machine Co. The top plate *A* is hinged to the base *B*, so that by releasing the bolt *C* the bar can be quickly removed and turned end for end in the holder. The bar carries the roughing tool in one end and the finishing tool in the other.

The pin *D* is used in order to insure that the bore of the fixture will always be parallel to the ways of the lathe bed, although as originally built it was intended to use this pin for locating the positions of the bracket *B* when indexing it upon the cross slide as is done with a turret. In the latter case the second pin *E* would serve to fix the tool slide in a central position. The present method of operation has been found to be quicker and equally satisfactory for the class of work on which it is used.



LATHE FIXTURE FOR HOLDING DOUBLE-ENDED BORING BARS

WHAT *to* READ
—for the man in a hurry



Suggested by the Managing Editor

LEADING space this week is devoted to a brief description of a Wickes Brothers special purpose lathe which has just come on the market. This machine was designed for machining crankshaft line-bearings and flanges at a rate commensurate with modern automotive production practice. This brings to mind a letter which arrived in our office shortly after the publication in our European edition of the description of another Wickes crankshaft lathe which you may remember some months back in the *American Machinist*. The letter was from an incredulous Scot who apparently was not familiar with American production methods for he could not believe the output figures which were given for the machine and asked us to explain. He was charitable enough to suggest a possible typographical error for "he had operated one of the best British crankshaft machines and it took as long to set up the work for each cut as the time given in the article for the whole job."

What to read was not a difficult matter to decide two hundred years ago when books were few and magazines unheard of. It is far different now when so much reading matter is offered to pass the time pleasantly or profitably as the reader chooses. We are doing our utmost to make the "American Machinist" not only profitable but indispensable as a clearing house of ideas and news of the machinery world. This page is the editors' advertisement of their section of the paper. It gives the high spots.

A letter from us to the maker brought sworn production figures from one of the automobile factories which we took great pleasure in forwarding to the skeptic. We have heard nothing further from him.

Part II of Mr. Farquhar's "How Do You Regulate Materials?" begins on page 101 and deals with receipt, storage and records. The author goes the Ten Commandments six better by prescribing sixteen rules which are well worth considering even if you decide not to accept all of them.

Engineers and designers are offered an unusually good assortment of technical articles in this issue, even if we do say it ourselves. On page 105 A. J. Schwartz digs back twenty-five years into the files of the *American Machinist* and resurrects a controversy over the acme thread. He closes his short article with some sensible suggestions. Following this on page 107 is a somewhat popularized description of that invaluable measuring tool, the optical flat. Written by H. S. Van Keuren, an old Bureau of Standards man and a recognized expert in gage work, it gives an easily understandable account of the principles underlying the use of the optical flat and some carefully worked out rules for the guidance of the novice in its use. Don't miss this for we have another article along the same lines from the Bureau of Standards which goes much further into the science of the matter and which will be published very shortly. Immediately after Mr. Van Keuren's article, on page 112, we reprint the suggested standards for line and machinery shafting adopted by the committee of the A. S. M. E., appointed for this purpose. It represents another forward step in mechanical engineering economics. One more reference to the Bureau of Standards and we have done for this week. Pages 121, 122 and 123 give the "Characteristics, Treatment and Uses of High-Speed Steel" from the point of view of the Bureau's Division of Metallurgy. If you use high-speed steel you will want this information.

Another special automotive machine tool is described on page 124, the Foote-Burt Piston-turning machine. It is made both as a roughing and as a finishing machine.

Two more definitions of a machine tool appear on pages 106 and 126, one by A. L. De Leeuw and the other by L. L. Thwing, two of our regular contributors. Do you agree with either of them?

There is still another tool description outside of the Shop Equipment Section in this issue. It starts on page 117 and takes up the development of the Powell planer.

We are going a little light on automotive material again this week for we have only the short concluding article on the manufacture of the Splitdorf magneto. We have more of Fred Colvin's comparative articles in the mill, however, and they will appear very shortly. He has more cylinder data and also some additional information on piston manufacture which will round out our series on those important parts. There is also a picture story on making wristpins which is novel and valuable.

The letter from our London correspondent, page 142, is unusually interesting this week. It shows that the cost of living and the output per man in the shops are just as serious questions in England as they are here.

EDITORIALS

What Production Engineering Should Mean

NARROW viewpoints have been responsible for much of our industrial troubles. They have prevented us from securing many of the benefits which we might have otherwise obtained. When the so-called scientific management failed it was because those who installed it were blinded by a lot of rules and forms which prevented them from seeing more than one side of the problem.

The same handicap is being found in the efforts of the production engineer to secure maximum production. As with the old "speed boss" of earlier days, he is often the "best hated" man in the shop, when in reality, he should be the most popular, if things were properly managed. Maximum production should bring the greatest returns to both employer and employee, without of course resulting in undue exertion or fatigue, and the man who accomplishes this should earn the gratitude of both sides.

The difficulty appears to be that too many employers and production engineers seem to think that their duties begin and end with the taking of time studies and the setting of piece or bonus rates. In reality they should include, or be in close touch with, all that goes to make up production. The production engineer should maintain close contact with the employment department and with those who look after industrial relations, not forgetting the education of apprentices and the up-grading of older men. He should be on the most friendly terms with the tool designers and the department foremen, and the closer his contact with the workers themselves, the better results he will secure.

One of the most important studies for a production engineer is that of psychology. It has far more to do with real production than time study or motion study. A knowledge as to how the human element will react under different conditions is invaluable in securing the best results.

We have been too prone to consider only the physical and mechanical side of the question, to think of machinery rather than of the surroundings. In many large hand-made cigar factories there are readers, who read by the hour as the men roll the cigars. In other classes of work music has been found to aid in maintaining interest and increasing the production.

Neither of these methods will apply in machine-shop work, but there are possibly other things which might be used. Clean shops, well painted machines, and even flower beds outside affect most men favorably whether they realize it or not. Whatever will add permanently to a worker's energy and well-being is part of the production engineer's job. If red geraniums in yellow boxes will add 2 per cent to the output they are just as much a part of his work as a similar expenditure for tools and fixtures. If good photographs of work sent out, or of current events, will add to the output, by all means let them be posted.

Production engineering is a much broader profession than we have been apt to think. It is most honorable because increased production adds, or should add, to the welfare of the community and of the country. Production engineers should aim to see that it means this and nothing less.

F. H. C.

Exhibits of American Products in Argentina

TO THE manufacturers of the United States has come an unusual opportunity for the establishment or the augmentation of trade with South America. This is due, of course, indirectly to the conditions existing as a result of the war, but the preceding statement was prompted by a fact entirely apart from these conditions.

In the June 17 issue of the *American Machinist*, an exposition of United States manufactures at Buenos Aires, Argentina, was announced. The date of this exposition has been changed, so that it will begin on March 15, 1921, and continue for at least 30 days. The object is to introduce American manufactures, on a large scale, to the business men and to the general public of Argentina and the surrounding countries.

The need of developing trade with South America is not thoroughly appreciated by many manufacturers, simply because they have plenty of domestic orders to keep them busy at present. Everyone has heard of the fellow who left his roof in bad repair because, when it rained, he could not fix it and, when the weather was nice, there was no need of fixing it. The viewpoint of American manufacturers is the same, as a rule. They have little permanent foreign trade because, when they really feel the need of a foreign market, it is too late to develop it and, when there are plenty of domestic orders to go around, there is no use in bothering with other countries.

Manufacturers in other countries do not view this matter in the same light. Great Britain and Germany controlled a large percentage of the South American market before the war. These nations are now busy rebuilding and recuperating at home. The injury which we received in the war is hardly comparable to that which they have endured. Also, the post-war efforts made by the manufacturers of our country and those of Europe to obtain the South American trade are not comparable. The United States receives the worst of this comparison, however. While we are letting this market in our own hemisphere go unexploited, European nations are right now sending what goods they can to this section and also getting large blanket orders without even promising delivery dates, in order to exclude us.

If this market is so valuable to Europe, it is even more valuable to us, and some of our big manufacturing concerns fully realize it. Too bad that they are in the minority. Although we can do without this market right now, we are going to need it soon. Now, however, not then, is the time to develop it.

Here is the point to the discussion. European coun-

tries will not be on a normal production basis and fully entrenched in the South American trade before about two years. The manufacturing facilities of our country are at the present time greatly enlarged. At this time when the markets of the world are open to us with very little competition offered, why not enter them? It can never be any easier than it is now. Once established, the worth of our products should secure a permanent trade. The exposition previously mentioned offers a means of putting goods from the United States before the buyers of South America. It is a much more effective method than the use of catalogs and agents, for seeing is believing.

A word about this exhibit. It is conducted by the American National Expositions, Inc., with offices in the Bush Terminal Sales Building, New York City. This organization plans to give expositions in foreign countries of our products, and it has the approval of the United States Government.

Buenos Aires was chosen as the location of the first exposition because of the richness of the field about Argentina and the large import trade of that country. Think of the publicity that can be given to American goods by having some 500 manufacturers exhibiting and selling. Particularly as it is the opinion of the promoters that practically all of Argentina's business men will attend the show.

Besides the actual business which the exposition will create, the friendly feeling which will arise from increased intercourse between the countries will be of value to both of us. What is of more moment just at present, we can get started before European trade is too strongly entrenched.

Don't wait until it rains before you think of repairing the roof. C. J. P.

The Child Labor Laws and Apprentices

By R. P. Deane

I have been interested in reading, from time to time, articles about the scarcity of boys who want to learn a trade.

I think that one cause, in some states at least, for so few boys being interested in serving an apprenticeship may be attributed to the Child Labor Law. Now, I do not want any one to get the impression that I do not think that each one should have as good an education as his circumstances will permit, for there is nothing so useful to a man as a good education, but my criticism of the labor laws is their limiting the things that a boy is permitted to do, until he is so old that he thinks he is a man. In Massachusetts it is against the law to use boys under sixteen for practically any machine-shop work other than pushing a broom—and there isn't much to be learned at that.

Of course I do not believe in boys being engaged in hazardous work, but I do not think that any fair-minded man would say that running a small lathe, drilling machine, shaper, or milling machine, is really hazardous. These laws seem to be directed more to limiting the number of boys who can afford to learn a trade, and as such they are very effective.

Few shop owners or manufacturers feel that they can afford to teach boys a trade and pay them high wages at the same time, and a boy of sixteen or over requires quite a little money for running expenses now. Most of his friends probably make good pay and he feels that he should make as much as they do. His parents, particularly if they have several more coming along, think that the boy must be self-supporting, or more. Starting to learn a trade at sixteen means that he does not begin to get the good pay until he is nineteen or twenty, at which time some begin to think about marriage and homes of their own.

I believe it is generally considered that a boy serving a three-year apprenticeship is a loss the first year, about an even break the second, while he may produce a slight profit the third. After the third year the chances are that he will try another shop, so the employer really has nothing to show for his trouble in teaching the boy.

Let us take the case of a boy who begins work other than a trade at fourteen. If he is bright and willing he will probably increase in value by the time he is sixteen until he will earn about double what he can get for the first year in learning a trade. He does not take kindly to having his wages cut in half by becoming an apprentice; neither do the parents think he should have to begin at the bottom again, so he keeps on at what will very likely prove a dead-end job.

This is doubly true at the present time, when many men, with no real knowledge of any trade, are making as much—and often much more—as machine operators, than the real mechanics make. What is not realized is that the chance of stepping out of the shop and into a responsible position is good for the real mechanic, but is practically impossible for the operator.

I have had men ask me many times to teach their boys the trade, but when told what wages they could expect, they immediately lost interest. Others have asked me to take in boys who were too young, and were very much disappointed to learn that it was against the law to use boys of that age on practically any shop work. Yet I believe that these same men would raise an awful howl about boys doing men's work, if any number of them were permitted to work at their own respective trades.

It seems like a very short-sighted policy to make laws which practically bar the children of comparatively poor people from having trades and then wonder why fewer of them each year try to learn trades. If the labor laws could be amended to allow boys of fourteen to use tools which are not really hazardous, I believe that there would be no scarcity of boys who would serve apprenticeships, or of manufacturers who would take care of them.

Impromptu Key for Milling Cutter

By Charles D. Folsom, Jr.

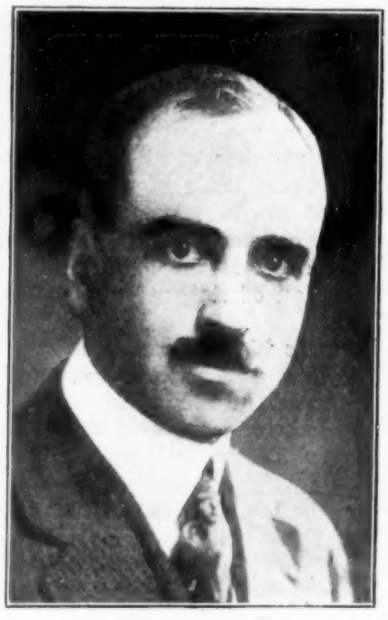
Every milling-machine hand knows how easily a narrow cutter, such as a slitting saw, will shear off a cold-rolled steel key used to hold it on the arbor. The remedy for this trouble is to use tool steel, but the extra work of filing a key from a round piece of drill rod very often causes a man to use cold rolled and "take it easy." However, one day when I was in a hurry and had just sheared a key, I happened to see an old file on the bench; in about five minutes I had filed up the end of the tang, broken it off in the vise, and put it in place on the arbor. The tang of a file is soft enough to file, yet not thoroughly soft, as it would be if it had been annealed, so it is just about right for a key.

Summer Meeting of National Safety Council

THE Engineering Section of the National Safety Council held its summer meeting in Chicago, on June 24, 1920. This section is composed of engineers engaged or interested in accident prevention and has done some important work in connection with the development of uniform safety standards.

The meetings were under the direction of Chairman C. P. Tolman, chief engineer of the National Lead Co.; Vice Chairman L. A. De Blois, manager of the safety department of the E. I. Dupont de Nemours Co., and Secretary Sidney J. Williams, secretary and chief engineer of the National Safety Council, Chicago. The Western Society of Engineers co-operated in arranging the meetings and loaned the use of its rooms. The morning session was devoted to the reports of a number of committees who have been conducting investigations in various lines of safety work. H. A. Schultz, of the U. S. Steel Corporation, reported for the committee on "Safeguarding Machinery at its Source," which has considered the problems of dealing directly with machinery manufacturers to urge them to properly safeguard their products instead of leaving this work to the purchaser. In part the report was as follows:

L. A. DE BLOIS



S. J. WILLIAMS

OFFICERS OF THE NATIONAL SAFETY COUNCIL SUMMER MEETING

"Some three years ago the National Safety Council appointed a committee with the same title as that of this committee. Probably the most important feature of its work was in paving the way with the Machine Tool Builders' Association and with the American Society of Mechanical Engineers. To see that this work was in a measure successful we have but to turn to the advertising pages of the mechanical publications, where page after page show machines pictured with hazardous points guarded. It is true that the guarding is not always adequate, and also that the manufacturer sometimes fails to guard all of the hazardous points, but on the other hand think of these machines as illustrated 10 or 15 years ago! In those days the gears, power transmission, etc., were devoid of any covering.

"It is perfectly obvious that the best time to plan the safeguarding of the machine is while it is being designed. Then only can we hope to incorporate the features essential to safety and obtain the kind of a job that is pleasing to the eye and satisfactory to the critical inspection of the engineer inspector and the plant manager. Too often the guards that are installed, after the machine is in its working position in the shop, are frail, unsightly and inadequate.

"Safety specifications should be based upon practical recognized safety standards and should be drawn up in a form so that they may be included and used as a whole, or in part, for any contract for construction work, or for purchase and installation of machinery and equipment. A set of safety specifications should be attached to, or embodied in, general specifications when originally submitted to contractors or manufacturers for bids. . . .

"If we begin with our own companies we may feel reasonably certain that later such demands will be made by the purchasing departments of all companies—in fact many of them have already begun, as you know. Always, we should emphasize the fact that manufacturers of machines that are adequately guarded have an advantage over their competitors whose machines are not guarded because the sales engineer can truthfully state that the machine, as delivered, will comply with the requirements of the safe practice inspection department of the State Industrial Commission and also the requirements of the various insurance companies."

The dangers incident to shifting belts on cone pulleys was the study of a committee under the chairmanship of H. E. Somes, of the Chevrolet Motor Co. In his report he said:

"At the last meeting of the Engineering Section of the National Safety Council, I volunteered to obtain time studies on mechanical belt shifters for cone pulley belts and on the hand method. After going through a number of large machine shops, I was very much surprised to find that with the exception of an isolated instance, belt shifting devices for cone pulley belts were not used; and due to that fact, and also the short period of time left to investigate this subject, I have been unable as yet to obtain the time studies. One of our factory managers, who has a successful belt shifter installed, expressed it as his opinion that a green workman can shift cone pulley belts by means of the belt shifter as rapidly as an experienced workman can shift them by hand—with the additional advantage that in doing so he is safeguarded from injury. However, I have been convinced of the fact that mechanical belt shifters can be or already are developed that will shift belts on cone pulleys more rapidly than by hand—much more safely and efficiently and without serious injury to the belt itself.

"The problem seems to be, where should cone pulley belt shifters be required. A shifter has its maximum value when it is installed on a machine where belts are shifted many times per day. Where a saving can be realized in the workman's time due t an improved method of shifting belts and the machine itself gains a greater capacity, these advantages will become more apparent, in proportion to the number of belt changes. Usually the advantages become of lesser importance as the number of shiftings decreases.

"Among installations where cone pulley belt shifting devices are desirable are the toolroom, and maintenance and repair shops.

"Considering the modern manufacturing machine shop, such as the automobile plant, we are struck at once by the fact that belt shifting is very uncommon, and in fact in many cases, if the manufacturer could obtain them, single

purpose machines would be purchased. In the production machine shop an individual machine is tooled up for a single job and frequently this machine runs several years without any change in the method of manufacture, speed or feed.

"As an illustration of this point: Recently I went to the Chevrolet Motor Co.'s manufacturing plant in Flint, to see a screw machine which had been fitted with a mechanical belt shifter. I asked the operator what he thought of the shifter and how much it aided him. He replied that he thought the belt shifter was satisfactory but that he had been employed on that particular job for approximately eight months and in that time had never used it to shift belts except to satisfy himself that it would work. This condition exists throughout that entire plant.

"The field for greater service of the belt shifter undoubtedly would be in shops not engaged in production manufacturing, but where, on account of the special nature of the different jobs, wide variations in the spindle speeds are necessary. This also applies to drill press operations where the step cone pulleys are exposed within 12 or 18 in. of the floor. Drill presses, excepting where they are used over long periods of time on a single operation, require a large number of belt changes throughout the working day, owing to the different sizes of drills which may be used.

"While observing a belt shifter at Flint, I noticed that it seemed to be satisfactory in shifting from high to low; but in shifting from low to high speeds the belt curled and caused difficulty. The plant engineer advised that the shifter had been thoroughly satisfactory until the belt became oil soaked from long use.

"In order, however, that we may obtain accurate information as to the advantage of using mechanical belt shifters over the hand shifting method, and also to ascertain whether a satisfactory shifter has been developed, the Chevrolet Motor Co. has arranged to conduct a test on several types of shifters. This test will be strictly impartial, and we hope to learn if the belt is injured by using a mechanical shifter and whether or not the shifters are satisfactory after the belt has become thoroughly oil-soaked and very pliable."

Safety Educational Work

A committee headed by Bruce W. Benedict, manager of the shop laboratory, University of Illinois, has considered the questions connected with the promotion of educational work. This report was presented by W. D. Keefer, who said in part:

"Almost every one familiar with the engineering courses offered in the average technical school and university in our country agrees that our student engineers are being taugh technical subjects that fit them to solve problems where materials, machines and forces of nature are involved, but that practically nothing is taught to assist them in solving the problems involving men. . . .

"Many persons interested in safety think that a presentation of the principles of accident prevention to student engineers will assist materially in developing a proper understanding of men, and at the same time make a valuable addition to the student's engineering knowledge. They base this statement on the fact that successful safety work is the result not only of the proper application of true engineering principles but also of the ability to understand and handle men.

"The National Safety Council has in the past two years been devoting some time and money to the consideration of this problem and the following suggestions are the consensus of the comments of the committee.

"1. Safety education in enginering colleges should not be confined to preparing safety engineers. A greater effort should be made to impress all engineering students with the fact that safety is an integral part of efficiency. Such courses as machine design, shop practice, industrial management and others are particularly suitable for the inclusion of the study of safety work.

"2. Safety can be presented to the engineering educator and the engineering student, as a subject definitely related to engineering efficiency rather than as a humanitarian subject.

"3. Opportunities should be provided for engineering professors to take up summer work in the safety departments of some of the large companies.

"4. Encourage colleges to take out a $15 a year membership in the National Safety Council, which membership will make available all the Council's bulletins and other publications.

"5. Urge colleges to post safety bulletin boards in the engineering shops and keep them alive with the Council's bulletins and other literature pertaining to safety.

"6. Assist engineering colleges in establishing individual safety museums.

"7. Attempt to have the standard engineering handbooks introduce a safety section to include safety codes and principles that apply to the particular branches of engineering which the handbook covers."

Safety Code Committees

Various sub-committees have been engaged in compiling codes for standard safeguards for different classes of machinery. Their work was reported by R. H. Guerrant, safety engineer of the National Safety Council. Items worthy of note follow:

"When the Council was asked to sponsor the code on power presses we at once set about organizing a committee of representative men to formulate this code. Various engineering societies and organizations, including the National Association of Machine Tool Builders, the Bureau of Standards and all State Industrial Boards were invited to appoint representatives on the committee. . . .

"In the preparation of this code we already have as reference some very valuable pamphlets on the subject. Among these I might mention the 'Safe Practices' pamphlet on power presses issued by the National Safety Council, a bulletin on 'Safety Devices Used by Members of the Sheet Metal Ware Association,' bulletin on 'Stamping and Punching Presses,' issued by the Utica Mutual Insurance Co. and other similar publications, together with the codes of various states, some of which contain provisions relating to safety in punch press operations.

"As soon as the committee has been formed the work of actually producing the code will be started. This work will likely be handled largely from the National Safety Council offices, and the code in tentative form will be forwarded to the various members of the committee for their action.

"A similar course was followed in the handling of the paper and pulp safety code. State boards were invited to name representatives to serve on the committee as were the several organizations of paper and pulp mill men."

During the afternoon session F. J. Littel, president of the F. J. Littel Machine Co., spoke on "Automatic Feed for Power Presses." He described the different types of automatic feeding devices which have been successfully applied to power-press operation, including both the roll-feed and dial-feed methods of handling the work to and from the dies. He also described new developments in the line of magazine feed together with automatic sorting and loading devices that make the operation of the power press almost independent of the attention of a workman. Mr. Littel was followed by A. L. Kaems, safety engineer of the Simmons Co., Kenosha, Wis., who spoke on "How We Increased Production by Safeguarding Power-Press Operation."

A dinner meeting in the evening concluded the program. H. G. Ellerd, president of the National Safety Council, presided. The addresses included: "The Engineer and Production," by W. G. Nichols, president of the American Manganese Steel Co.; "Safety and Production," by George A. Hart, superintendent of the Melrose Park plant of the National Malleable Castings Co.; and "Safety and Engineering Efficiency," by Sidney J. Williams, of the National Safety Council.

SHOP EQUIPMENT NEWS

-Edited By-
E. L. DUNN and S. A. HAND

SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and • equipment •

Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

• CONDENSED • CLIPPING INDEX
A continuous record of modern designs • and equipment •

Cincinnati 16-In. Gear Hobbing Machine

WITHIN the past few months several Cincinnati 16-in. gear hobbing machines have been placed in production service by their maker, the Cincinnati Goar Cutting Machine Co., subsidiary of the Cincinnati Shaper Co., of Cincinnati, Ohio.

The capacity of the machine ranges up to a maximum gear diameter of 17¼ in. with 12-in. face. It will cut spur gears of 3 D.P. in cast iron or steel; and helical gears of 3 D.P. in cast iron or 3½ D.P. in steel. Gears with either right or left helix may be cut, up to 45 deg. of angularity. The machine is regularly equipped with standard parts and change gears for cutting spur gears only. If helical gears are to be cut, proper data must be furnished the maker so that the proper gears may be supplied.

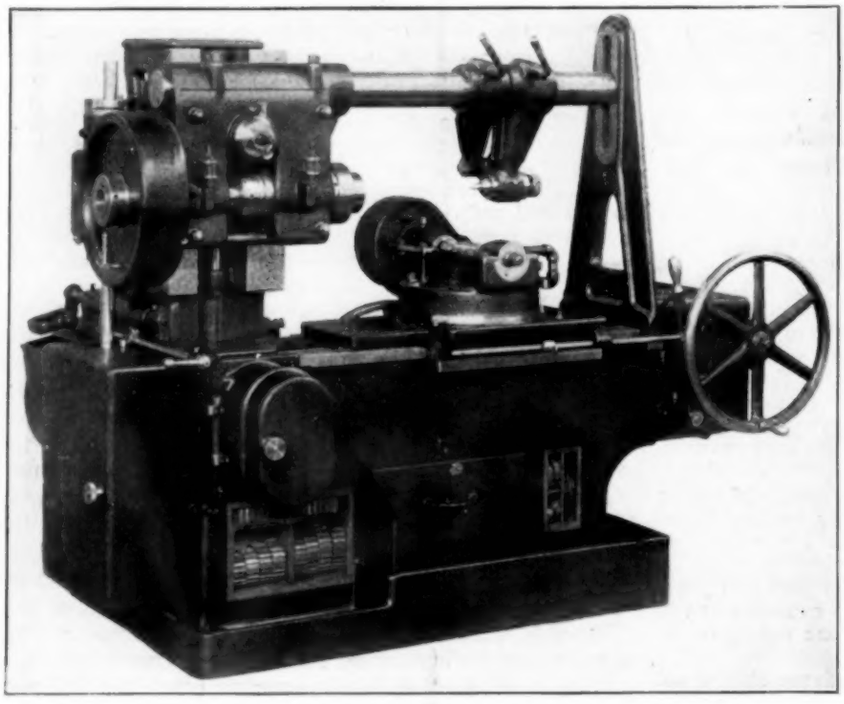


FIG. 1. CINCINNATI 16-IN. BELT-DRIVEN GEAR HOBBING MACHINE

Specifications: Rated capacity, diameter, 16 in.; face, 12 in. Actual maximum gear diameter, 17¼ in. Rated capacity, spur gears, 3 D.P.; cast-iron helical gears, 3 D.P.; steel helical gears, 3½ D.P. Maximum distance center of hob to nose of spindle, 19½ in. Maximum diameter of hob, 4½ in. Diameter hob arbor, 1¼ in. Taper hole in work spindle, No. 12 B. & S. Hob speed, 8 changes, ranging from 50 to 200 r.p.m. Hob feeds, 26 changes, ranging from 0.015 to 0.250 in. per rev. of work. Driving pulley, 15 x 3¼ in.; speed, 400 r.p.m. Over-all dimensions; covers closed, 52 in. x 82 in.; covers open, 56 in. x 103 in. Net weight of machine with electrical equipment, 5,600 lb.; domestic shipping weight, 5,900 lb.; export shipping weight, 6,600 lb. Contents boxed for export, 210 cu.ft.

The bed and housing are of box construction, heavily ribbed to secure rigidity. The column at the left side of the machine has a flat top on which the driving motor may be mounted, as shown in Fig. 2, or which may be used, in the case of a belt-driven machine, Fig. 1, to support an extra tool pan. A noticeable feature of the construction is that hollow-head screws have been used almost exclusively for assembling the main parts of the machine, giving it a smooth external finish.

Finished ways on the side of the column carry the work-spindle saddle which is taper-gibbed to long and narrow guides to prevent any sagging when the clamping bolts are loosened. The saddle is raised or lowered by a crank so it can be set for depth of cut or size of gear. The quill is fitted with a graduated dial reading to 0.001 in.

The indexing mechanism consists of a steel double-thread worm and cast-iron worm gear which are entirely inclosed and run in a bath of oil. Adjustments of the worm may be made for wear. The change gears for indexing are placed on the left end of the machine, Fig. 1, and are inclosed by the gear box cover.

The work spindle is horizontal and is rigidly supported by two long bronze-bushed bearings; the front bearing is tapered for adjustment to offset wear. The thrust bearings are alternate steel and bronze washers. The spindles are of hammered forged steel, bored to 1⅝ in. diameter and have No. 12 B. & S. taper. Spindle lubrication is secured through two sight-feed oil cups.

The work arbor is supported by a bracket carried on an over-arm 3¾ in. in diameter and provided with an outboard support bracket or A-frame. A double over-arm bracket is provided, only one portion of which is released for removing the work arbor. This bracket carries a center which insures the accurate and quick return of the work arbor to its proper position after reloading.

The ways which guide the hob carriage are square and extend the length of the bed. Taper gibs are used to adjust the carriage to the ways. The carriage may be swiveled through 50 deg. in either direction,

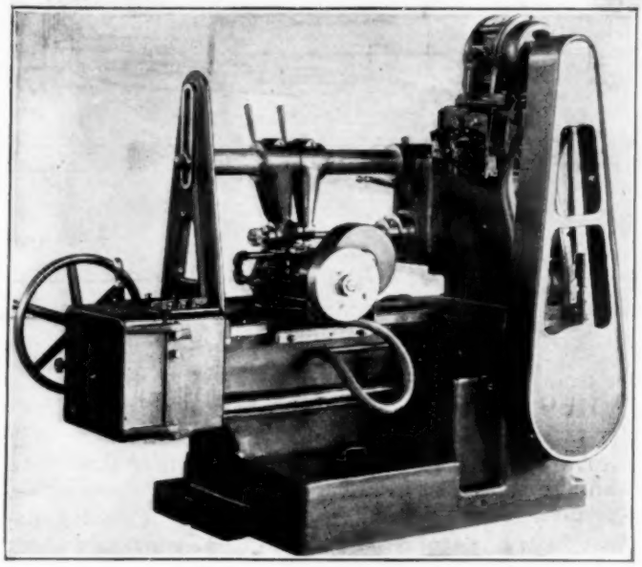


FIG. 2. REAR OF MOTOR-DRIVEN GEAR HOBBING MACHINE

and may be accurately set by a vernier reading to 5 min. Movement of the carriage is controlled by a handwheel located at the right front of the machine.

The hob spindle is driven by helical gears to insure smooth running. It is provided with bronze bushings and a taper bearing for making adjustment for wear. The bearing boxes are scraped into the saddle for perfect alignment and are capable of endwise adjustment. Almost all hobs are made with several more teeth than are in use at one time, and the work is started at one end of the hob, which, as it dulls, is shifted endwise until the entire hob is dulled. On account of its being possible to adjust the hob spindle endwise, it is not necessary to reset the hob on its arbor.

The speed box for the hob spindle is inclosed in the case on the front of the machine. There are eight standard changes of hob speed. The feed change gears for the carriage are in a case at the right end of the machine and give twenty-six changes of feed ranging from 0.015 in. to 0.250 in. per revolution of the work. The gearing for the feed is driven through a worm and worm gear, and is provided with a trip to stop the feed mechanism only.

The machine may be entirely controlled from the operator's position in front. If motor driven the motor control switch is located on the front; if belt-driven the machine is controlled by the clutch-operating handle located back of the hob-slide handweel.

Automatic knockout is provided for stopping the machine at the conclusion of a cut; adjustable dogs either cut off the motor current or shift the belt clutch depending upon the type of drive.

A copious supply of coolant is an essential for successful results on gear hobbing machines and careful attention has been given to providing for this. The coolant is contained in an ample reservoir in the bed, into which it drains from a steel chip pan that receives chips and coolant through an opening in the carriage. A belt-driven centrifugal pump inclosed in the housing on the back of the machine furnishes the supply to the hob through flexible pipe which can be adjusted to suit the requirements of the work.

Mery Stampograph

The rotary stamping machine shown in Figs. 1 and 2 is designed to stamp letters, characters, etc., in metal or other material while it is in a soft or plastic condition. The machine is manufactured by Julius Mery, 2,842 North Maplewood Ave., Chicago, Ill., and is ordinarily furnished for hand operation, but can be arranged for power operation when required. The machine is self-contained and has a stamping capacity of thirty-five characters, as indicated on the face of the dial. Provision is made, however, for changing the size of the characters to suit the work being stamped. This feature can be better understood by reference to Fig. 2. Between the two large disks are pivoted thirty-five pinions, one for each character. Each pinion carries a hardened steel die on which different sized characters are cut and by rotating the pinions the desired sizes may be brought into indexing position. The pinions are rotated simultaneously by means of the knob *A* on the face of the dial, Fig. 1, and when set are locked by the nut *B*. Adjustment for work of different thickness is accomplished by means of the ball crank at the top of the machine and incidentally this regulates the depth of the impression which is set to the graduated scale shown at *A*, Fig. 2. The spacing for the different sized characters is automatically regulated and the machine is said to

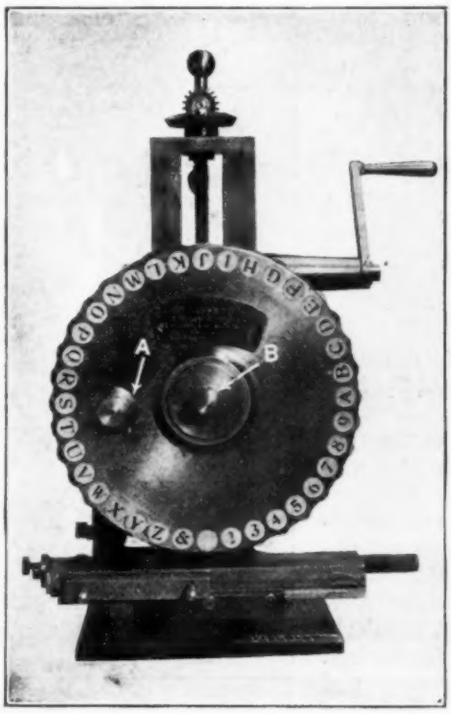


FIG. 1. STAMPOGRAPH, FRONT VIEW

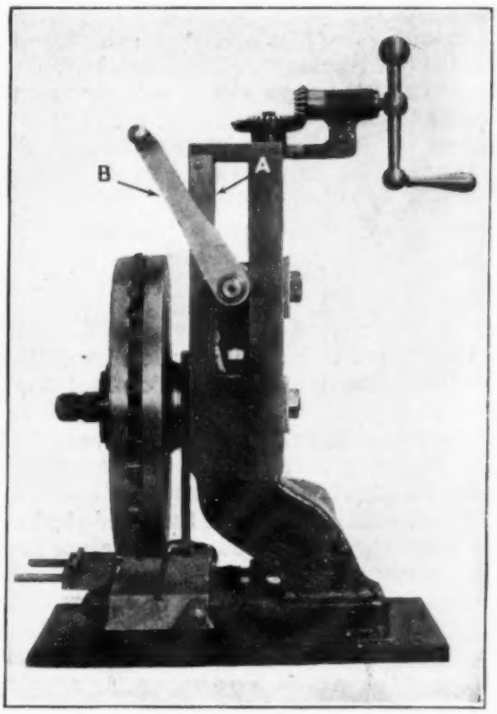
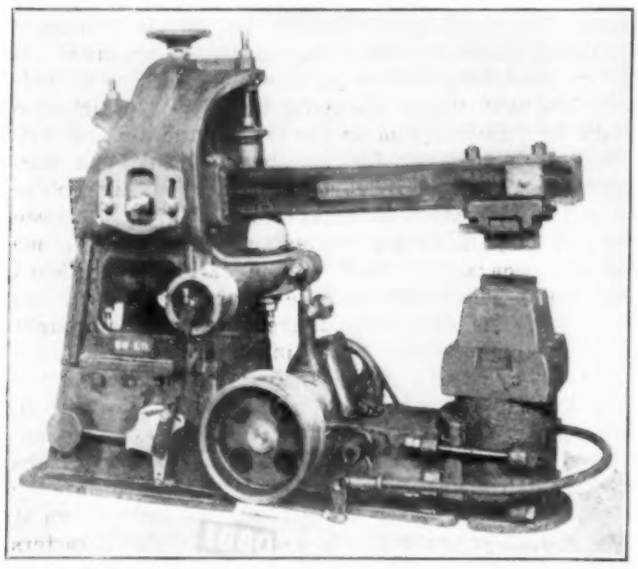


FIG. 2. STAMPOGRAPH, SIDE VIEW

space evenly and with good alignment. The impression is obtained by means of the crank *B*, Fig. 2, and provision is made against breakage should the metal be too hard. The hand-power machine weighs about 200 lb. The power-operated machine weighs 350 lb. and occupies a bench space about two feet square.

"American" Rubber-Cushioned Helve Hammer

Rubber-cushioned helve hammers of improved design, as illustrated, are being manufactured by the Long & Allstatter Co., Hamilton, Ohio. The hammers are made in five sizes, ranging from 25 to 100 lb. capacity. It is claimed that all connections and parts that have a tendency to work loose are carefully protected against such trouble. The treadle is arranged to prevent lost motion between it and the belt-tightener and is said to be sensitive and smooth acting in regulating the force and rapidity of the blows. The steel brake-band with its friction lining passes almost entirely around the brake wheel and, owing to its greater area of friction surface, assures quick stopping of the hammer with the helve in the "up" position when the treadle is released.



"AMERICAN" RUBBER-CUSHIONED HELVE HAMMER

A pair of ordinary dies having faces partly flat and partly round is furnished as part of the regular equipment.

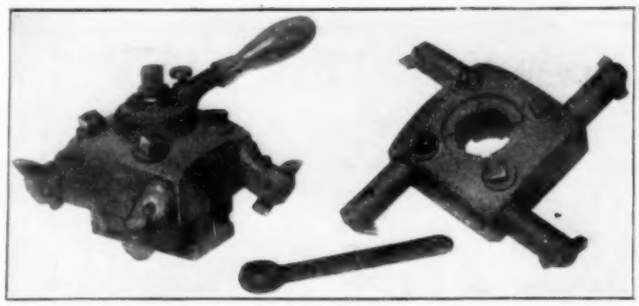
Lovejoy Turret Toolpost

The turret toolpost illustrated herewith is a recent addition to the line of the Lovejoy Tool Co., Inc., Springfield, Vt.

One movement of the binding lever releases the turret, accurately indexes it to the next tool position and again rigidly clamps it to the base.

The turrets are made of hardened steel and are interchangeable with any base. This feature permits the use of a number of turrets carrying tool combinations for various jobs so that a job can be changed without changing the tool set-up. Two types of turrets are regularly made, one for outside turning and the other for boring.

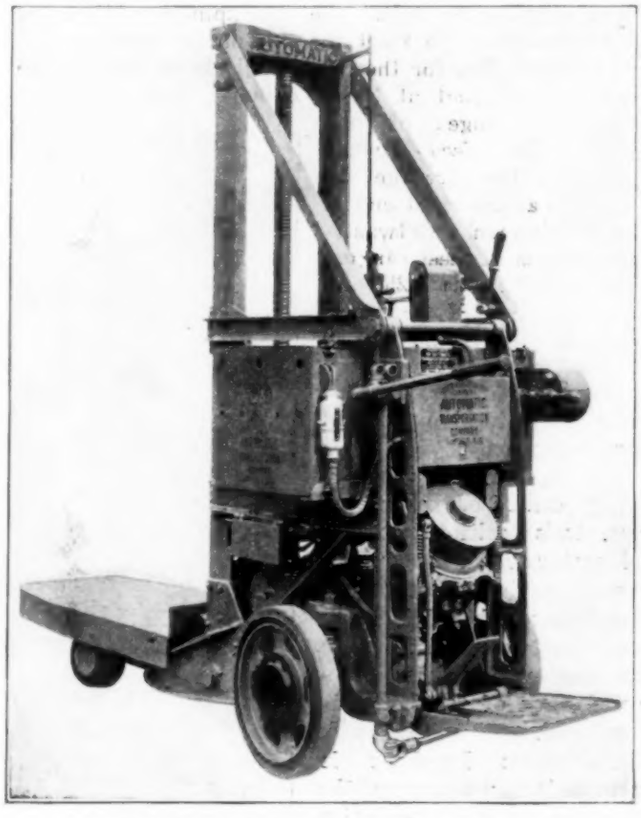
The turning tools have shanks 1 in. in diameter and are fitted with ½-in. high-speed steel cutters. The round shanks permit the holders to be rotated to give side clearance to the tools. The boring bars are 1 in. in diameter and will cut to the bottoms of holes that are only slightly larger than the bars. Bars of other sizes with bushings to fit holes in turrets can be furnished to order. The turrets can be used on lathes having a center distance above the tool block as small as 1¾ inches.



LOVEJOY TURRET TOOLPOSTS FOR OUTSIDE AND INSIDE WORK

"Automatic" Lifting and Tiering Truck

A lifting and tiering truck of the type shown has recently been placed on the market by the Automatic Transportation Co., Buffalo, N. Y. The function of this truck is to pick up and elevate loads with its own power, to suitable heights for placing material in box cars, on trucks, wagons, etc., without rehandling. It has a capacity to lift a load of 4,000 lb. any distance from 1 in. to 6 ft., and at the rate of 1 ft. in 15 seconds. The overhanging platform is supported on two sturdy uprights. It is provided with substantial guide rollers, and is raised and lowered by a single screw of large size re-



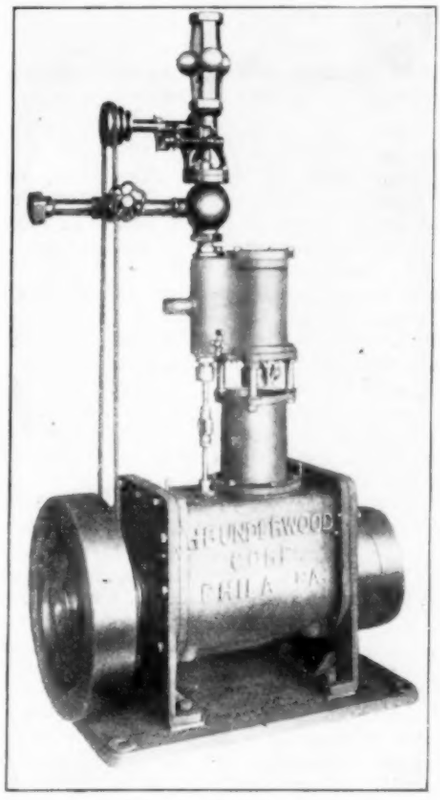
"AUTOMATIC" LIFTING AND TIERING TRUCK

volving in a heavy bronze nut carried in a trunnion. An oil reservoir furnishes ample lubrication to the screw. The motor may be started and stopped at any point in its travel, and is provided with automatic limit cutouts to prevent overrun of the platform at either extreme. Platforms or skids of standard heights, designed for use with electric lifting trucks, may be used with this machine.

Underwood Steam or Air Engine

H. B. Underwood Corporation, 1015-25 Hamilton St., Philadelphia, Pa., has added to its line the small engine, shown in the illustration, which can be driven by either steam or compressed air. The engine is built in both a 3- and a 5-hp. size, and is designed for driving portable tools such as boring bars and drilling machines.

The cylinder of the 3-hp. engine is 3½ in. in diameter and that of the 5-hp. is 4½ in. in diameter, both engines

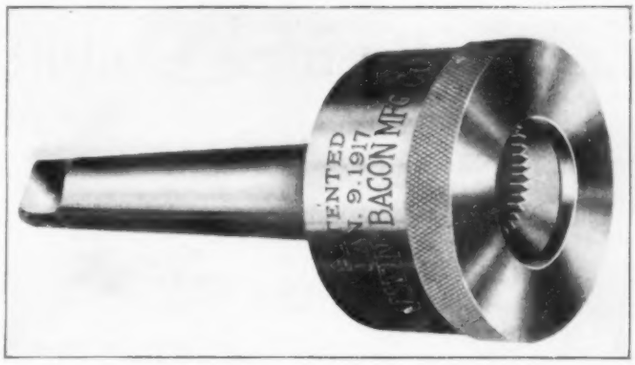


UNDERWOOD STEAM OR AIR ENGINE

having a 3½-in. stroke. The working parts are inclosed in an oil-tight case which is formed in the base of the engine and serves to exclude dirt. The crankshaft is a steel forging with a 1½-in. finished diameter. A piston valve is used, and the engine is fitted with a governor on the supply line. The engine runs at 250 r.p.m. with 70 to 125 lb. supply pressure. The floor space required is 12 x 21 in., and the height to the top of the governor is 46 in. Net weight, 270 lb.

Gustin-Bacon Reversible Driving Chuck

The chuck shown in the illustration has recently been placed on the market by the Gustin-Bacon Manufacturing Co., 1416-18 West Twelfth St., Kansas City, Mo. The chuck grips when driven in either direction, being especially designed for service where it is desir-



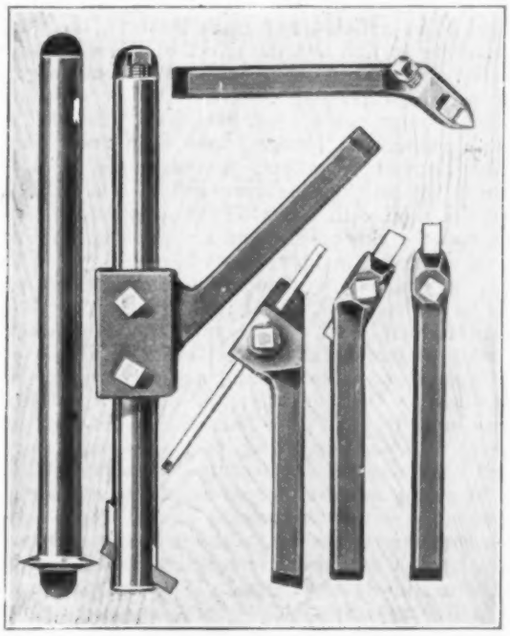
GUSTIN-BACON REVERSIBLE DRIVING CHUCK

able to reverse the direction of rotation, as in running staybolts in fire boxes and in driving straight-shank taps.

The jaws shown are used for holding round bars; one size, suitable for accommodating bolts from ⅞ to 1¼ in., being carried in stock, while other sizes can be furnished upon order. Jaws for holding square heads can be furnished, the stock size accommodating square heads from ⅞ to ⅞ in. The jaws are tool steel, and can be easily replaced when worn out. It is claimed that the chuck grips the bolt centrally, so that it runs true. The base of the chuck shank is squared to 1¼ in., so as to permit the setting of a staybolt with a wrench when desired.

"Ready" Garage Lathe-Tool Set

The Ready Tool Co., of Bridgeport, Conn., has placed on the market a set of lathe tools for small machine shops and garages, as illustrated herewith. The set



"READY" GARAGE LATHE-TOOL SET

comprises tools for both inside and outside turning and threading. Also a cutting-off tool. The tool board furnished with the tools has a place routed out for each individual tool, making it easy to keep the tools in their proper places and to note whether any are missing.

Business Conditions In England

FROM OUR LONDON CORRESPONDENT

THE prophets of impending doom grow more numerous and observers are not wanting who predict that a crisis is actually at hand. For one thing it is felt that prices have just about reached their limit. But this feeling has been experienced more than once since the European war was ended. Certain it is that on the part of capitalists, hesitation is being shown. Possibly the fear of a tax imposed on war wealth, or of a levy raised on capital, may lately have been the predominant item in the mental outlook.

Certainly, some branches of engineering are experiencing a decline in the actual receipt of orders, but most have work in hand to last them for months. The motor-car (that is, the pleasure car) industry and, to a lesser extent, the machine-tool trades, may be included. Speculators in pleasure cars, people who ordered simply that they might sell at a profit as soon as the car was actually delivered, are cancelling orders, and the statement has been made that "a wave of economy is sweeping over the motor trade just as much as in other trades." There are, in fact, rumors that one or two small firms are going out of the business, while it has long been asserted that several remain in existance simply on the strength of deposits paid by intending purchasers. The automobile industry of Great Britain has been in a peculiar position, for, unlike other branches of engineering, it has actually been financed in advance to a considerable extent by its own customers. By the way, the Austin Motor Co., will, according to present plans, export one-third of its production of motor cars and one-half of its motor tractors.

WORKERS PRESSING FOR 44-HOUR WEEK

Meanwhile engineering workpeople seem determined to press for the 44-hour week. Some time ago it was agreed that this demand should be withdrawn temporarily (that is, until the result of an inquiry into the present economic conditions in engineering and shipbuilding, both in Great Britain and other nations, was made known), the purpose, of course, being to find out the effect of the 47-hour week as compared with the 53-hour week, and some organized workmen have been growing restive.

This joint inquiry has not yet been held. Instead, statements, both public and private, have been made showing considerable decrease in output. For example, D. B. Morison has been saying that the average hours actually being worked in the shop with which he is concerned, after making allowances for absence for various reasons, are now but 44; the net decrease in hours, as compared with pre-war conditions, is 9 hours, or about 17 per cent. Further, in the works of Richardsons, Westgarth and Co., Ltd., marine engineers, of Hartlepool, Sunderland and Middlesbrough, "the actual time now taken to complete a given amount of work is, on an average, nearly half as long again as it was before the war." Consequently, it seems the output in a given week must be but 55 per cent of that obtained in pre-war times. "Fortunately," adds Mr. Morison, "there are indications of an appreciation of the undoubted fact that the costs of production are now so extravagantly high that, if the continuous demands for still higher wages are persisted in, commercial success will ultimately become impossible. Demand will then cease and a slump, and unemployment, must inevitably follow. The desideratum at the moment is the restoration of at least pre-war output per man per hour. There are already distinct signs of a slackening demand for ships."

BAD TIME-KEEPING, ETC., BEING INVESTIGATED

Reference to want of production, bad time-keeping, etc., is being made all over Great Britain. At a launching of a cable-laying and repairing vessel at Fairfield it was stated that delay had been caused not simply by the natural difficulty of changing over from war to peace, but also by lack of steel and by restrictions imposed on labor by trade unions. On the other hand, it is but fair to say that at the launching in the same district of the latest Cunarder, Sir W. Beardmore mentioned that, while in 1913 the average time lost in the Dalmuir yard was 13 per cent; in 1919, partly due to the later morning start and also to the increasing interest in production, the loss was but 6.4 per cent. This still seems a fair-sized amount.

It will be noticed that, speaking of the Northeast Coast of England, D. B. Morison mentioned distinct signs of a slackening demand for ships. A report from Glasgow, relating to the Clyde area, of course, is to much the same effect. But in all the districts a considerable amount of re-conditioning is on the way and in fact the yards are full and orders are in hand for further ships. At the moment not much misgiving need therefore be felt. Nevertheless, with a decline in certain freights, ship owners are more anxious and inquiries have been made as to the possibility of cancelling orders.

LITTLE EXPECTED IN THE WAY OF WARSHIP CONSTRUCTION

Little is expected in the way of warship construction; in fact Armstrong, Whitworth & Co., Ltd., when launching the light cruiser "Emerald" at its Armstrong yard, suggested that special mention might be made of the fact, as this "will probably prove to be the last war vessel to be constructed in a private contractor's yard for several years to come." The firm named has made further developments, and is to build water turbines in the works of the associated firm, Armstrongs & Main, Glasgow.

It has long been known in Great Britain, and the fact has been publicly pointed out, that the home supply of engineers with special training and experience in hydro-electrics is somewhat scant, and a party of about a dozen Cambridge engineering students was recently formed to visit Norwegian power plants of this kind. Some of them will, it is expected, also receive further training in Norway.

The workpeople concerned in shipbuilding at any rate do not view the immediate future of employment with misgiving. They have proposed to claim a further shilling an hour in the Clyde district. Alternatively, it is suggested that a number of the trades shall combine in a rather more modest claim; that is, 6d. an hour, or 23s. 6d. a week. It is possible that the engineering workpeople will join in, but before this the new engineering trade union amalgamation (a dozen or so of smaller unions, but dominated by the Amalgamated Society of Engineers) may have its own say.

Neither are engineers the only class of workpeople demanding the 44-hour week. Gas workers all over the country have recently taken a ballot, and 96 per cent of those employed at the present time voted in favor of a strike to enforce not only a 10s. increase in weekly wages, but also the 44-hour working week, with double pay on Sundays and holidays, and a fortnight's annual holiday. Notices to leave work on June 26 are being prepared, but further negotiations are anticipated. As to the premium bonus system, the few thousand London pianoforte workers still remain on strike.

TWO JOBS BEING HELD BY ONE MAN BEING PROTESTED

While some men are thus agitating for a shorter week in their own trades, others are protesting against the performance of two jobs by one man. The boot trades have been meeting. They noted the tendency of organized workpeople who both agitate for shorter hours and also close the door of their own trade against outsiders, but yet are willing to occupy their spare time in competition with traders and others. The government therefore is asked to license all traders, and further to insert in their proposed 48-hour working-week bill a clause which will make it illegal for any regularly employed person, male or female, to do work of any describtion for personal gain after that period had been worked.

The railwaymen have not obtained the additional £1 a week claimed, but, on the other hand, increases have been awarded by the wages board set up, the increases ranging from 7s. 6d. a week to 4s. a week in London and industrial areas, and half these rates for country districts. A further advance in fares is foreshadowed, though not necessarily quite to the extent of 110 per cent on pre-war fares which would have been necessary if the whole of the workers' demand had been met. Apart from the effect of the new concessions, it had been estimated that an increase of 80 per cent on pre-war rates would be needed. The figures given suggest the possibility of fares being simply at double pre-war rates for the future.

Lack of Castings Felt

Complaint of lack of castings is made from practically every engineering center, especially perhaps by makers of machine tools. Up and down the country a number of foundries are being built, but this may only accentuate the evidence of shortage of skilled labor. Lack of raw material, too, has held up both shipbuilding yards and engineering shops on the Clyde. Pig iron in the district is particularly scarce, and although many people in the automobile industry have received the impression that their requirements have been neglected and shipyards favored, a shortage of steel plates has been reported from Glasgow. In fact, some 1,500 tons were recently obtained from South Wales, and this is said to be a record. In pig iron so pronounced is the difference between supply and demand that it was suggested recently in the House of Commons that the Scottish iron-founding industry is faced with a crisis. The increase in the cost of coal has caused pig iron to rise in price, and in London recently Stafford crown iron bars, previously quoted at £31 10s. from the works, were raised to £33 10s., which means practically an increase of 33 per cent over the price in 1920.

Iron Castings Also Scarce

The scarcity of steel castings is no less pronounced than that of iron castings, and railway congestion is again alleged as the cause of delay in the supply of rails, plates, etc.

While America is understood to be accepting orders for structural steel for delivery from July to September, on the other hand, at the market named it was mentioned that January orders were only just being delivered. Some iron and steel firms have been insisting on payment by their customers of advances on material already manufactured but not delivered, and a committee of manufacturers and merchants in London have been considering the subject. The material is that which has been left in the yards owing to railway congestion and therefore not delivered and consequently not paid for. The claim for the advances arises because the banks, who were willing some time ago to give credit on material sold in such conditions, now simply suggest loan accounts.

Machine-Tool Prices Being Raised

An increase in engineering time wages of 3s. a week has just been made, in accordance with the last agreement; consequently some machine tools are being raised in price by 5 per cent, and others by smaller amounts.

The subscription list has been opened in connection with the formation of William Asquith (1920), Ltd., high-speed radial drilling machine manufacturer, capital £600,000, divided into 300,000 8 per cent cumulative participating preference shares of £1 each and £300,000 ordinary shares of £1 each. Apparently, the vendors take 150,000 ordinary shares as part of the purchase price. The Halifax business, it is shown, was founded in 1865 by William Asquith, and the area for works, etc., is more than 12 acres, with 650 workpeople. The prospectus states that the consideration fixed by the vendor company, William Asquith (1919), Ltd., for the sale of its assets and undertaking is £484,000. The assets have been valued at about £598,353, including £402,-359 for land and freehold property, fixed and loose plant, fixtures and office furniture, etc.; £25,000 for motor cars, wagons, etc., patterns, molding boxes, drawings, designs and jigs; £166,994 for stock-in-trade; plus £4,000 invested in Associated British Machine Tool Makers, Ltd. The effect of the molders' strike is shown in the estimated profits. For the six months ending with September 30, 1919, these were put at £60,971; but for the whole year ending with March last the estimate is £76,000, subject to audit. The profits for the year ending with March, 1913, were £15,329, and the highest profits, £96,404, appear to have been made in the year ending March 31, 1918.

New Issues of Capital Reach High Figures

New issues of capital reached high figures during April but were relatively few toward the end of May. Taking the present year so far the total reaches more than £213,000,000. According to a statement issued by a London bank, in the full year ending with May last the capital issues amounted to £387,738,000, of which almost exactly one-sixth was in the nature of overseas investment and five-sixths was for home purposes. Before the war it was a complaint that capital was not invested in British industries, etc., or rather that it was insufficiently invested at home, and it would probably not be difficult to find a year in which the proportions given above for home and foreign investment were reversed.

Regarding amalgamation, it is understood that Bolckow, Vaughan & Co. have acquired a controlling interest in the Darlington Rolling Mills Co., Ltd., the capital of the first-named firm being about £5,000,000. Statements have been made that Baldwins, Ltd., who have large iron and steel and coal interests in South Wales, and include some seven companies, will be acquiring an undertaking connected with steel in the Midlands of England.

Household Coal Supply To Be Unrationed

From now on, the supply of household coal for Great Britain is to be unrationed and purchasers will be able to deal with any merchant from whom they can get supplies, registration being dropped. Nobody anticipates that a fall in price will result. Although in theory competition between merchants will come into play, this section of business is probably just as well ringed as any other. In order to allow for decontrol, the amount of coal allotted to export has been reduced; it will be 1,750,000 tons a month instead of 2,000,000 tons. The Profiteering Act, which has been amended, is to be relied on to prevent excessive charges. The government controls the price at the pit head, wholesale and retail prices being otherwise unrestricted. The weekly output of coal from the mines continues unsatisfactory, still failing to reach the hoped-for 5,000,000-ton figure.

A Home Office return relating to mines under the Coal Mines Act shows, as compared with pre-war figures, an increase of 5.6 per cent in the number of persons employed in this industry, with a decrease of about 20 per cent in the output. The average output per person employed underground was 332 tons in 1913 and 253 tons in 1919; or regarding persons employed both under and above ground the output figures respectively were 267 tons and 201 tons. It may be mentioned that the present London price for best Derby coal is about 57s. a ton as against 27s. in 1913. The respective pit head prices are 33s. 5d. and 13s.

Lapointe Machine Tool Co., Ltd., Starting a Small Works

The Lapointe Machine Tool Co., Ltd., is starting a small works at Edgeware, to the north of London, which will shortly employ between 50 and 60 men. The building was already in existence. The plant is entirely American and as closely as possible the technical and commercial methods of the Hudson organization will be followed. Some few American workers are already engaged. It is not the intention to build machines or even standard broaching tools. All the tools made, according to the present program, will be special.

The buildings cover some 16,000 sq.ft. of floor space but at present only about 9,000 sq.ft. are in use. Further land available will double the existing works area. J. L. Owens is in charge (he is at present leaving for the United States) and with him is associated Mr. Coleman.

SPARKS FROM THE WOR

Valentine Francis

Foreign - Trade Development Cruise Offers Bid for "Von Steuben"

Ford Eggena, of New York, representing the foreign-trade development cruise, was the sole bidder on the steamship "Von Steuben," recently offered for sale by the Shipping Board. Mr. Eggena, whose bid was received and opened on July 7, offered $1,500,000 for the vessel, the amount to be covered in monthly payments up to Dec. 20, 1920.

The Board did not take action on the bid, reserving time to go into its details. Mr. Eggena's proposal was in the form of a letter directed to the Shipping Board. The letter, which contains all the terms of the bid, follows:

Referring to your letter of the 1st inst. and my letter of the 24th of June to the manager of ship sales, I beg herewith to submit to you my bid for the purchase of the above-named vessel.

1. Purchase price—$1,500,000 (one million five hundred thousand only).

2. Terms—A. Certified check for the sum of $150,000 (one hundred and fifty thousand only) 10 (ten) days from the date the U. S. Shipping Board approves of said sale and the purposes to which the vessel is to be put, in writing.

B. Vessel at the option of the Shipping Board to be taken over to the Morse Dry Dock and Repair Co., Brooklyn, N. Y., at once at my expense and reconditioning started immediately, entirely at my risk and expense or transfer to said docks not to take place until certified check is deposited, viz., within 10 days as per par. A.

(C) Vessel to be fully covered by insurance immediately.

(D) Balance to be paid in the following installments free of any and all interest: Aug. 20, 1920, $150,000; Oct. 20, 1920, $250,000; Nov. 20, 1920, $350,000; Dec. 20, 1920, $600,000; Total, $1,350,000; previous paid 10 days $150,000; total purchase price, $1,500,000.

3. Vessel to be reconditioned for the round the world commercial cruise to build up and stimulate our foreign trade and which will at the same time be the greatest advertising medium for our merchant marine.

Accommodation, first class only, and vessel to be refitted with the best of everything, no expense being spared to make her the finest vessel afloat.

4. We will convert said vessel into an oil burner provided that the Shipping Board will guarantee the supply of fuel oil at the various ports of call on this cruise, entering into an agreement as to price and supply of said fuel oil.

5. Reconditioning of vessel to be carefully carried on so that she can be put into first-class passenger service at any time.

6. At the termination of the first world cruise, which will take about one year, if deemed advisable, the vessel will continue on another cruise of this nature; if not, she can be put into pasenger service, such service and route to be agreed upon between the U. S. Shipping Board and the Foreign Trade Development Cruise management.

7. We desire the full co-operation of the U. S. Shipping Board and need their moral support, together with that of the Department of Commerce, which we have.

8. Fullest details of the entire enterprise and the many advantages it offers, not only to our foreign commerce, but to our merchant marine, will be gladly supplied and if given the opportunity to present the facts to the Board in person, I feel that the result would be satisfactory to all. It is our earnest desire to co-operate to the fullest extent with the U. S. Shipping Board.

Auction Sale of Machine Tools and Belting

An indication of the trend of prices of Government machinery, when sold at auction, is given by such a sale held in New York City, July 8 and 9. This machinery was not under belt and consequently did not bring as high prices as might have been the case if the buyers could have seen it in operation. In general, the prices ran over 50 per cent of catalog list. A few of the sale prices follow:

Becker milling machine rotary vises	$36
7½-in. universal geared scroll chucks.	19.50
9-in. universal geared scroll chucks.	22
10½-in. universal geared scroll chucks	25
12-in. three-jaw universal geared scroll chucks	30
Waterbury grinding machine	60
Rivett No. 205 hand-operated radial grinding machine	350
Rivett No. 106 automatic internal grinding machine	750
No. 2A Becker vertical milling machine	475
No. 4B Becker vertical milling machine	950
No. 3A universal horizontal boring machine	3150
Snyder 36-in. heavy-duty upright drilling machine	600

Professor Breckenridge Appointed Chairman of Advisory Board

Professor L. B. Breckenridge, head of the department of mechanical engineering of Yale University, has been appointed by the Secretary of the Interior as chairman of the advisory board which is being formed in connection with the survey being made of the power resources of the north Atlantic seaboard. The work is being done under an appropriation granted at the last session of Congress.

Summer School for Foreign Trades

A summer school of Pan-American and Foreign Commerce is to be held in Washington, from July 19 to Aug. 21, for the purpose of spreading information as to the problems of export business and the way in which they may be solved.

The main object of the course is evidently to promote Pan-American commerce, but it will also extend to other countries. In view of the fact that our commerce with the Americas has increased 450 per cent in the last fifteen years, attention is called to the possibilities in this direction and the necessity for retaining and increasing this business.

Further information can be obtained from Clarence J. Owens, Executive Director, 1000 Vermont Ave., Washington, D. C.

War Plants to Manufacture Small Motors and Wiring Devices

The General Electric Co., which recently acquired the vast war plant of the Remington Arms Co., at Bridgeport, Conn., will use the plant for the manufacture of small motors and wiring devices. It has recently announced the following appointments for the Bridgeport plant: W. S. Clarke, as general manager; J. P. Catlin, manager of production in motor department; Herbert A. Hagadorn, superintendent of maintenance of grounds and buildings; C. W. Collins, director of industrial relations.

Mr. Clark was formerly connected with the assistant manager's office at Schenectady; Mr. Catlin was formerly engineer of the motor division at the Pittsfield, Mass., plant, and Mr. Hagadorn and Mr. Collins come from the Schenectady plant.

The Bridgeport plant contains thirteen five-story brick and steel and concrete factories, each 240 x 80 ft. Connecting buildings make these one vast factory. The plant has a complete boiler plant and power plant.

New Motor Truck Plant, Fort Wayne, Indiana

The International Harvester Co. of America, Inc., with general offices in Chicago, has purchased a 140-acre tract of land just east of the city limits of Fort Wayne, Ind., and will erect thereon a plant for the manufacture and assembling of motor trucks.

The first unit of the plant will be an assembling unit and will cover an area of twelve acres. It will consist of an L-shaped, three-story, reinforced concrete building to house the carpenter shops and shipping department, also a number of standard one-story steel buildings of the monitor type, adapted to progressive assembly.

The company plans to start the erection of the first unit early this coming fall and to have it completed within twelve months. The ultimate development of the entire plant as now planned will extend over a period of three years and will require an expenditure of about four million dollars.

Incidental to the construction of the plant proper, will be the development of a number of transportation and civic projects; including a railway connecting the several steam railroads entering Fort Wayne from the east, the extension of streets, street railway lines, sewers, water, electric light, gas and telephone services, and the construction of about one thousand homes for future employees.

LD'S INDUSTRIAL FORGE
News Editor

French Commerce Chamber Has Catalog-File System

The American Chamber of Commerce in France has inaugurated a catalog-file system, the object of which is to place catalogs of American firms before important and reliable French buyers. Under this system preliminary correspondence can be abolished. French buyers come to this Chamber and, from an inspection of the catalogs, choose the articles they desire, without loss of time. They can then communicate immediately with the seller without having to wait two months or more to receive trade literature.

Catalogs can thus serve the purpose of a representative in France. The catalog file has been given extensive publicity and is under the direction of courteous and experienced personnel.

A nominal fee is charged by the Chamber to cover expenses incurred. This fee entitles each subscriber to have catalogs on file for the period of one year and also entitles the subscriber to ten different headings in the catalog card index. If the subscriber desires to be listed under additional headings an additional fee is charged.

Upon receipt of catalogs, address cards are filled out, showing name and number assigned to the catalog. These cards are systematically filed under the headings given by the subscriber. The catalogs are placed in individual file boxes, each box being given a number. This number is placed on each of the file cards.

For further details and for the catalog file entry blank, write to the American Chamber of Commerce in France.

New Uses for Stainless Steel

(Consul W. J. Grace, Sheffield, England.)

It is the writer's opinion that the use of stainless steel will become absolutely necessary in many articles and machinery exported from the United States. While he was stationed at Aden, Arabia, captains of ships, users of automobiles, and others complained that iron and steel parts rusted very quickly. The climate seemed really to "eat" into these metals. The life of the automobile was considerably shortened by corrosion of its metal parts. The manufacturer who first produces and places on the market in Eastern and tropical countries an automobile, the metal parts of which are of stainless steel, ought easily to capture these markets. Machinery parts, golf-club ends, clocks and watches, made wholly or partly of stainless steel, will be in great demand in the East and in tropical countries.

Fred. A. Bigelow Elected President of Carpenter Steel Co.

The Carpenter Steel Co., Reading, Pa., on July 1 announced the election of Fred. A. Bigelow as president of the company, succeeding N. B. Kunhardt, who is now chairman of the board of directors.

Mr. Bigelow was born in Paxton, Mass., on Jan. 31, 1868. His people moved to Worcester when he was eight years old and it was there that he was educated. He graduated from the Worcester Polytechnic Institute in 1891.

The following year he obtained employment from Spaulding & Jennings Co. (later part of the Crucible Steel Co. of America) as chemist, and in 1900 was sent to Providence, R. I., as manager of the Providence warehouse for the Crucible Steel Co. of America.

Mr. Bigelow entered the employ of the Carpenter Steel Co. in 1904 as New England salesman and in 1910 was transferred to the Cleveland warehouse of the company as Western sales manager. In May, 1915, he was transferred to Reading as general sales manager.

Report Martens Contract

A contract was reported to have been signed on June 25 by Ludwig C. A. K. Martens, unrecognized Russian Soviet "ambassador," and Boyer, Sloan & Co., Canadian and English manufacturers' agents, Montreal, for several million dollars worth of Canadian machinery.

Stanley Works Holds Sale Conference

The annual sales conference of the sales force of the Stanley Works was held recently. Yearly the men who are engaged in furthering the sales of the corporation gather in New Britain to discuss the year's growth, sales results, and to gather any suggestions from the various sales agents which might tend to add to the efficiency of the selling force.

The Stanley Works this year met jointly with the Stanley Rule and Level Co., so that the salesmen who were in session far outnumber any gathering of past years. This was the first gathering of men of the two companies in a joint session for discussion of business matters.

While no salesmen from the Japanese branch were present, the same was represented by men from the San Francisco branch, which cares for Oriental business. A total of sixty-four sales agents were registered at the conference.

International Chamber of Commerce Urges Reciprocal Trade Treaties

Restoration of international credit, based on the fixing of the amount and the conditions of payment for the debts of all countries, whether Allies or enemies, was urged at the first meeting of the International Chamber of Commerce in Paris, according to cabled reports to the Chamber of Commerce of the United States. The first comprehensive summary received here also gave the measures recommended by the conference to clear the financial situation.

The new organization was created in Paris by the 500 delegates from the five countries which last fall participated in the International Trade Conference at Atlantic City. These were Belgium, France, Great Britain, Italy and the United States. Business interests in other countries will be taken in later. Among other policies urged at the Paris conference, as made public by the Chamber of Commerce here, were the following: It was resolved that all allied states should agree also as soon as possible to fix definitely the amount and conditions of payments according to the stipulations in the treaty.

There should be an avoidance of duplicate taxation of wealth on individuals or organizations in more than one country.

Extension of credits, uniform banking laws and war damages were dealt with.

Reciprocal international treaties relative to import and export taxes were advocated.

An international credit bureau was planned.

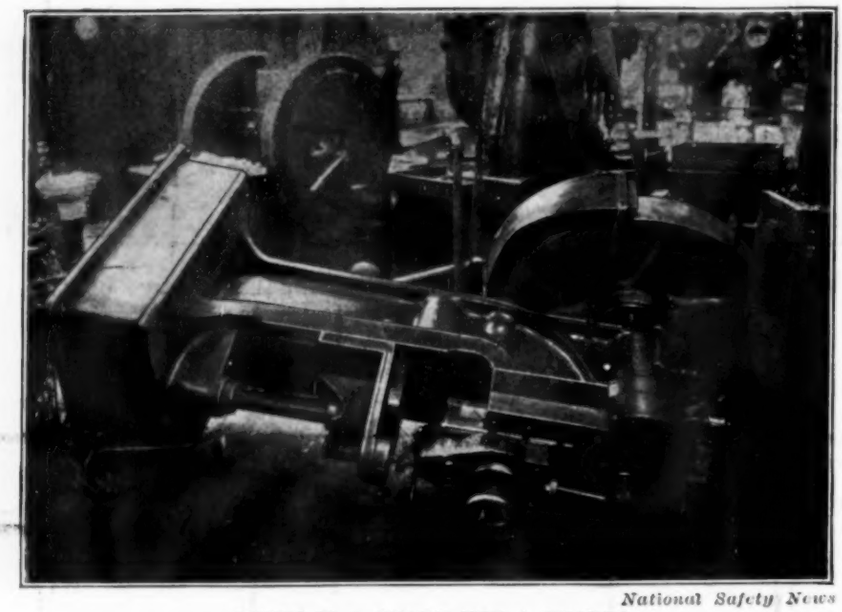
National and local chambers of commerce were requested to co-operate with their governments to reduce national and local governmental expenditures.

Governments and banking, commercial and industrial associations in all countries were urged to co-operate with the international chambers and with each other to reduce importation of non-essentials by countries whose exchanges are depreciated and to increase exportations from such countries.

There should be an endeavor to obtain the co-operation of labor to prevent delay in the turn around of ships, delay between ships and trains, and delay in transportation by rail.

There should be restriction as far as possible upon countries whose exchanges are depreciated issuing foreign loans.

There should be a reconstruction



National Safety News

WHEN IS A GUARD NOT A GUARD?

The belt slipped off the driving pulley of this punch press, caught in the guard and pulled the press over.

special committee to study the exchange situation.

There should be inducement of foreign investments in home countries.

It is desirable to furnish raw material and credits.

There should be facilities and simplification of passport procedure.

A committee was proposed to investigate the mischievous use of trade names and of misleading indications.

Common nomenclature was proposed for customs tariffs of the Allied nations.

Revocation of import and export prohibitions was urged as soon as international conditions of each country will allow.

A resolution petitions the board of directors to establish a central bureau for international statistics covering production, with forecast of output and probable needs of each country.

The world's stock of fuel was discussed.

A resolution urges hastening of utilization of hydro-electric power, development of measures for the use of mineral fuel scientifically and economically, and development to the utmost of research in the extraction of coal and oil resources of the world.

The full meeting expressed an opinion that Germany had not demonstrated an intention to fulfill its obligations to the Allies, as agreed in the treaty of Versailles. Allied governments were urged to tolerate no further delay in the carrying out of the treaty agreements.

The next meeting of the international chamber will be held in London next June. Temporary headquarters have been established in Paris. The location of the permanent headquarters is left to the board of directors.

The chamber elected the following officers: President, Etienne Clementel, former Minister of Commerce in France and member of the Supreme Economic Council. Vice Presidents, A. C. Bedford, New York city; Baron Edouard Empain, Belgian banker; A. J. Hobson, Sheffield, England; Vitorio Rolandi Ricci, Italy.

Directors for the United States: John H. Fahey, formerly president Chamber of Commerce of the United States; Willis H. Booth, vice president Guaranty Trust Company, New York, and formerly vice president Chamber of Commerce of the United States; Edward A. Filene, president William Filene Sons' Company, Boston, and formerly a director in the Chamber of Commerce of the United States.

Reed-Prentice, Becker and Whitcomb-Blaisdell Form Combination

The Reed-Prentice Co., Worcester, Mass., Becker Milling Machine Co., Hyde Park, Mass., and Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass., have formed a combination of their sales, purchasing, accounting and executive departments.

This combination took place about a week ago and the main offices are now permanently located at 53 Franklin St., Boston, Mass. This arrangement has been contemplated for several months and is in line with the modern method of doing business, wherein several concerns owned by one interest can work to better advantage through one main office and sales department.

The various agents throughout the United States that formerly handled the products of these facories are now displaced by direct factory branches in the various machine-tool centers of the United States.

These three companies now have combined sales branches in Boston, Worcester, New York, Detroit, Chicago, Cleveland and Indianapolis. The personnel and the location of the various offices of the three companies follow:

Boston—executive office—53 Franklin St.: A. H. Wood, president; Graydon Stetson, vice president; J. W. Lund treasurer; J. P. Ilsley, sales manager; F. W. McIntyre, sales manager; V. A. Campbell, sales department; F. E. Rhodes, sales department; G. S. Haven, sales department; F. H. Palmer, purchasing agent; S. L. Crawford, advertising manager.

Worcester — Reed-Prentice Co., Cambridge St.; A. E. Newton, vice president and general manager, and F. L. Hendrickson, engineering department. Whitcomb-Blaisdell Machine Tool Co., 134 Gold St.; Charles Hildreth, president and general manager, and F. H. Seng, sales department.

Hyde Park, Boston—Becker Milling Machine Co.: Scott Taylor, works manager; H. S. Sawyer, manager cutter department; A. S. Morse, salesman cutter department, and A. MacDonald, salesman cutter department.

New York—5th Floor, Grand Central Palace: P. K. Dayton, New York sales manager, and P. A. Dyer.

Chicago—temporary office, 621 Washington Blvd., c/o R. E. Ellis Engineering Co. About Aug. 1 or 15—26-28 North Clinton St.: W. D. Creider, Chicago sales manager; F. C. Herman, and J. L. Stone.

Detroit—408 Kerr Building, corner Fort and Beaubien Sts.; A. J. Strong, Detroit sales manager, and W. B. Ashley.

Cleveland—408 Frankfort Ave.; C. A. Severin, Cleveland sales manager, and Charles Brandhill.

Indianapolis—940 Lemcke Annex: T. C. McDonald, Indianapolis sales manager.

Standardization of Plain Limit Gages

A sectional committee of the American Engineering Standards Committee, 29 West 39th St., New York City, has just been organized to undertake the standardization of plain cylindrical gages for general engineering work, under the sponsorship of the American Society of Mechanical Engineers. The immediate occasion for undertaking the work was a request of the British Engineering Standards Association for cooperation on the subject. The committee held its organization meeting on June 11. It is understood that this committee will recommend to the American Engineering Standards Committee that the scope of the work should be broadened so as to cover all plain limit gages for general engineering work.

The present personnel of the committee is as follows:

E. C. Peck, chairman, general superintendent, Cleveland Twist Drill Co.;

L. D. Burlingame, vice chairman, industrial superintendent, Brown & Sharpe Manufacturing Co.;

H. W. Bearce, secretary, gage department, Bureau of Standards, secretary, National Screw Thread Commission;

P. W. Abbott, Lincoln Motor Co.;

John Bath, president, John Bath & Co., Inc.;

Earle Buckingham, engineer of standards, Pratt & Whitney Co.;

Fred H. Colvin, editor, *American Machinist;*

W. A. Gabriel, chairman, draftsman and designer, Elgin National Watch Co.;

F. O. Hoagland, vice president and works manager, the Bilton Machine Tool Co.;

Edward H. Ingram, works manager, the Cleveland Drilling Machine Co.;

J. O. Johnson, office of Chief of Ordnance, War Department;

A. W. Schoof, gage engineer, Greenfield Tap and Die Corporation;

G. T. Trundle, consulting engineer, Engineers Building, Cleveland, Ohio;

H. L. Van Keuren, the Van Keuren Co.

A dispatch from Clarksburg, W. Va., announces that a syndicate of manufacturers of diversified interests has purchased coal mines and undeveloped coal land valued at $12,000,000.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Shearing Machine, Plate, 7-Ft.

Regent Shears, Ltd., Wakefield, England.

"American Machinist," English Edition, May 29, 1920

The machine is designed for cutting plates up to ¼ in. thick and 7 ft. long; and gaps are provided in the side standards, so that the ragged edges of plates of any length may be trimmed. The plates are held down by a toggle lever arrangement operated automatically by a cam on the crankshaft. A micrometer adjustment is provided for raising the bottom blade after grinding. The machine is equipped with a mechanical brake, which does not engage during that part of the stroke where no braking is required and which prevents rebounding of the crank. The drive is through cut gears, a 10-hp. motor being required. The overall size of the machine is 14 ft. 3 in. x 9 ft. 6 in., and the weight is about 8,600 lb.

Drilling Machine, Multiple Spindle D-12

Fox Machine Co., Jackson, Mich.

"American Machinist," June 24, 1920

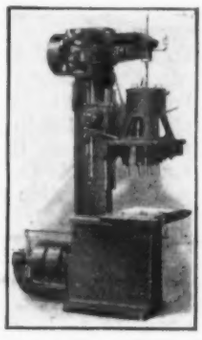


Table and column are bolted to base which contains the reservoir for coolant. Column is of box section and houses counterweight for the spindle head. Gear box, mounted on column, contains the spindle change-gears, shafts for which are mounted on Hyatt bearings. The feed gears are contained in a box at side and are controlled by levers on outside of box. Feed is engaged by a quick-acting clutch operated by a lever.

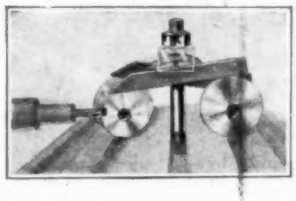
Specifications: Head; travel, 15 in.; drilling surface (rectangular) 8 x 14 in., (round) 12 in. Center of head to face of column, 12 in. Table; working surface, 17 x 22 in.; height from floor, 2 in. Number of spindles, 10 to 16. Clutch pulley, 14 x 4¼ in.; speed, 450 r.p.m. Power required, 10 hp. Floor space, 28 x 36¼ in. Height, 105 in. Weight; net, 2,250 lb.; crated, 2,500 lb.; boxed for export, 2,900 lb. Export box, 96 cu.ft.

Clamp, Force Universal

Burwin Co., Inc., 87 Warren St., New York City.

(Made by the Black Rock Manufacturing Co., Bridgeport, Conn.)

"American Machinist," June 24, 1920

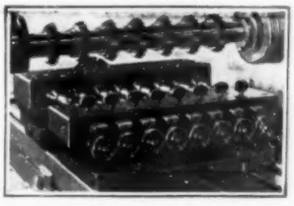


The accompanying illustration shows one style of the clamp for general use. The clamp is designed for holding work on machine tools, being particularly adapted to clamping irregularly shaped pieces, straddling bosses, or fitting different angles by means of the swivel adjusting device. The clamp is made of hardened steel and in a wide range of sizes.

Dividing Head, Multiple-Spindle

Scully-Jones Co., 80 East Jackson Blvd., Chicago, Ill.

"American Machinist," June 24, 1920



The spindles are all driven from an index plate located at the opposite end of the machine from that shown in the illustration. The work drivers are somewhat flexible so that they may be adjusted to suit work that is off center. Both the index plate and the work drivers are made to suit the needs of the user of the tool. All parts of the device are interchangeable. The dividing heads are built in six sizes with 2, 4, 6, 8, 10 or 12 spindles, as may be required. The device may also be arranged for cutting either spur or helical gears.

Transformers, MTQ Auto

General Electric Co., Schenectady, N. Y.

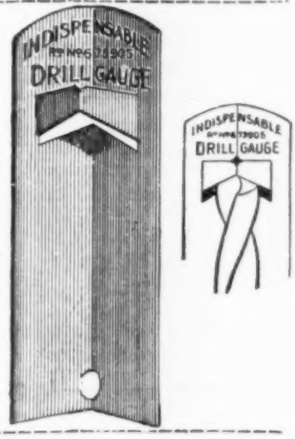
"American Machinist," June 24, 1920

Built as standard equipment with 1:1 ratio, principal application being to adapt polyphase motors to any circuit. Made in the following sizes: 1, 3, 5, 7, 10, 15, 20 and 25 kva. one of which is shown in the accompanying illustration. These transformers are air cooled, suitable for indoor or outdoor use, and are for service on 220-volt circuits having frequencies between 50 and 140 cycles per second. They are designed for deriving 3-phase current from 2-phase, 4-wire service, and vice versa; and they cannot be used either for 2-phase, 3-wire service, or for operating motors with inter-connected phase.

Gage, Drill Grinding

Crowther & Crowther, 3 Green Lane, Tue Brook, Liverpool, England.

"American Machinist," (English Edition), May 22, 1920



Gage provides means whereby the angle points of twist drills may be tested for accuracy against light. A bronze stamping or right-angle form is provided, the twist drill being held in the corner thus formed and gaged against the outline presented by a projecting piece which is cut and formed from the sheet metal. Gage is made in three sizes and is said to show an error of 0.001 in. Each gage is set to a master template. The three sizes are suitable respectively for drills up to ¼, ⅝ and 1 1½ in. diameter.

Drill, Pneumatic, Five Piston

Desoutter Brothers, Ltd., 51 Baker St., London W., England.

"American Machinist" (English Edition), May 22, 1920

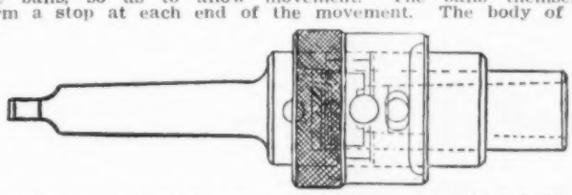
The pressure is controlled by a push button in the head of the casing. The machine weighs only 30 oz. and takes drills up to ¼ in. The tool is grasped in the palm of the hand and the air supply is controlled by a press button in the head of the drill. Essentially, it consists of casing, control, actuating mechanism, bearing and drill chuck, the parts being assembled within a casing of steel tube, knurled for convenience of handling. The motor is of unusual form, a block of five cylinders ⅞ in. bore and 1¼ in. stroke being arranged symmetrically round a central axis with the bores parallel.

Chuck, Drill, Quick-Change

Alfred Herbert, Ltd., Coventry, England.

"American Machinist" (English Edition), May 22, 1920

All parts of the chuck are hardened and ground, two grooves one in the body and one in the outer sleeve form an annular recess for a row of balls. The groove in the body is wider than the balls, so as to allow movement. The balls themselves form a stop at each end of the movement. The body of the



chuck is provided with a pair of ball plungers which hold the sleeve in operating position, thus enabling chuck to be used on a horizontal spindle, or a spindle which points upward. The actual gripping of collet is effected by a pair of larger balls contained in two holes in chuck body entering recesses milled in and running around the collet. Collets are bored to Morse standard tapers, and special collets can be made for special drills.

Importers of Machine Belting in South Africa

South Africa furnishes a good market for machine belting. Imports of this kind were valued at $97,350 in 1916 and $154,555 in 1917. The mines are the principal users. Consul Fred D. Fisher, of Johannesburg, Transvaal, has furnished a list of importers of belting in the Johannesburg consular district of South Africa, which can be obtained from the Bureau of Foreign and Domestic Commerce or its district and co-operative offices by referring to file No. 120347.

It is reported that many steel plants in the Pittsburgh district are depending on motor trucks to keep their yards sufficiently clear of finished material to allow them to maintain operation, some of the plants shipping over two-thirds of their daily output in this manner.

Personals

ARTHUR H. WEED is now president of the Reed-Prentice Co., Worcester, Mass., manufacturer of machine tools. ROBERT F. HERRICK, Milton, Mass., recently resigned from this office because of the pressure of other work.

ALFRED P. WILKES has been appointed employment manager at the Meriden, Conn., plant "D" of the New Departure Manufacturing Co., of Bristol, Conn. Mr. Wilkes was formerly connected with the Manning, Bowman Co., of Meriden, and was also with S. Sternau & Co., of Brooklyn, N. Y., for a period of twelve years.

FRANK MARON has been selected as superintendent of industrial relations at the Meriden, Conn., plant of the New Departure Manufacturing Co., of Bristol, Conn. Mr. Maron was formerly connected with the Aberthaw Construction Co., of Boston; the Winchester Repeating Arms Co., New Haven; International Silver Co., Meriden; Chas. Parker Co., of Meriden, and at the Meriden post office.

Trade Catalogs

Thread Milling Machine. Hall Planetary Thread Milling Machine Co., Bridesburg, Philadelphia, Pa. Catalog, 9¼ x 11¼ in. This catalog describes and illustrates its machine for milling external and internal threads. Specifications are also included.

Turret Lathes in Railroad Shops. Warner & Swasey Co., Cleveland, Ohio. Catalog, pp. 31, 9 x 6 in. This catalog has been prepared to illustrate and describe turret lathe "set ups" of many actual railroad installations, it also shows a list of railroad parts finished on the company's turret lathes.

Pulley Covers. Smith & Serrel, Central Ave. at Halsey St., Newark, N. J. Bulletin No. 201, pp. 11, 6 x 9 in. This bulletin describes how to decrease belt slippage, and to increase efficiency of belt drives. Directions for installing, and list prices are also given. It contains two line cuts, illustrating Pullmore pulley tread covers.

Grinding Wheels. Norton Co., Worcester, Mass. Catalog, pp. 10, 3¼ x 6¼ in. A small catalog describing commercial diamonds for truing grinding wheels.

Business Items

Riddell Brothers, of Atlanta, Ga., will shortly move its machine shop into a new building being constructed for it at 340 Whitehall St. The new shop will be one of the most modern of its kind in the Southeast. At present the company's shop is at 16 East Mitchell St.

The Delaware Engineering Co., Wilminton, Del., manufacturer of special machinery for domestic trade, reports enough contracts ahead to carry the plant at its present capacity for more than two years. In consequence of that the management is preparing to make extensive plant additions.

Worthington Pump and Machinery Corporation, New York, has purchased from the Platt Iron Works, of Dayton, Ohio, its drawings, patterns, jigs, templates, special tools, good-will and name.

The Foster Machine Co., of Elkhart, Ind., manufacturer of turret lathes and screw machines, has recently opened a New York office at the Grand Central Palace, in charge of L. S. Devos.

The New London Broaching Machine and Tool Co., of New London, Conn., has recently been organized to deal in broaching machines, etc., with a plant at New London. The officers of the new company are M. E. Infiorati, Jr., president, and Edward L. Streeter, Jr., secretary and treasurer. Both are experienced in the broaching business. The capital of the company is $25,000.

The C. J. Root Co., of Bristol, Conn., manufacturer of automatic counters, metal stampings, wrought brass hinges, etc., has issued $25,000 additional stock, divided into 250 shares at $100 par.

The O. B. Herlth Manufacturing Co., Inc., of Hartford, Conn., has been incorporated with a capital of $50,000, to make and deal in tools, machinery, etc. It has taken over the present O. B. Herlth Manufacturing Co., of 90 John St., Hartford, Conn. The incorporators of the company are O. B. Herlth, of Hartford, and W. C. Herlth, of Brooklyn, N. Y.

The American Chain Co., of Bridgeport, Conn., has recently added four more large plants to its seven. The new plants acquired are: The Highland Iron and Steel Co., with factories at Terre Haute, Ind., and West Pullman, Ill.; the Reading Steel Castings Co., of Reading, Pa., and the Page Steel and Wire Co., of Adrian, Mich., with a billet plant located at Monessen, Pa. The American Chain Co. has not escaped the problems of keeping up production in the past two years and making deliveries in the face of a shortage of raw material, and therefore plans to use the new plants to relieve its many production problems.

For the purpose of more closely cooperating with the industries of Philadelphia and vicinity, the Norton Co., Worcester, Mass., has opened a branch office for the grinding machine division at No. 324 Bulletin Building, under the direction of Paul Hoffman, district manager. The establishment of this branch office will in no way affect the distribution of Norton grinding wheels. This will be handled as in the past by Powell, Clouds & Co., No. 602 Arch St.

The Diefendorf Gear Corporation, Syracuse, N. Y., has been granted a license by the Westinghouse Electric and Manufacturing Co., to manufacture gears from Bakelite Micarta. The company has also leased larger quarters, due to growing business, and about Aug. 1 will be located at 324 Pearl St., Syracuse, with double its floor space.

The Trumbull Electric Co., Plainville, Conn., following the example of various other factories, will publish a factory magazine which will be called "Within the Circle." The magazine will be published once a month and will contain news of interest concerning the doings of the shop employes.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

A merchant company in Argentina desires to secure agencies for the sale of all kinds of automobile accessories, hardware, mechanics' and carpenters' tools, and machine tools. Correspondence may be in English. References. No. 33201.

An agency is desired by a man in Germany for the sale of hardware, machinery, iron, steel, and metal products, foodstuffs, and cotton. References. No. 33208.

An importing company in Switzerland desires to secure an agency for the sale of grinding machines, plain and universal, for cylindrical grinding, and surface grinding, also crankshaft grinding. The largest possible range is required in all types from 10 by 24 to the largest machines. Quotations should be given c.i.f. or f.o.b. the most convenient port. Payment will be made by draft. References. No. 32,970.

Forthcoming Meetings

The International Railway Master Blacksmiths' Association will hold its next annual convention at Tutwiler Hotel, Birmingham, Ala., on Aug. 17, 18 and 19. The secretary of the association is A. L. Woodworth, Lima, Ohio.

The American Steel Treaters' Society and the Steel Treating Research Society will hold their second annual convention and exhibition at the Commercial Museum, Philadelphia, Pa., on Sept. 14 to 18, inclusive. J. A. Pollak, of the Pollak Steel Co., Cincinnati, Ohio, is secretary of the former society.

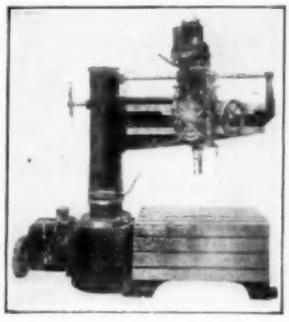
The American Foundrymen's Asssociation will hold its annual convention and exhibit at Columbus, Ohio, on Oct. 4 to 9. C. E. Hoyt, 1401 Harris Trust Building, Chicago, Ill., is secretary.

An exposition of U. S. manufacturers at Buenos Aires, Argentine Republic, S. A., has been arranged for the month beginning Nov. 15. Information can be obtained from the American National Exhibition, Inc., Bush Terminal Sales Building, 132 West 42nd St., New York.

Condensed-Clipping Index of Equipment

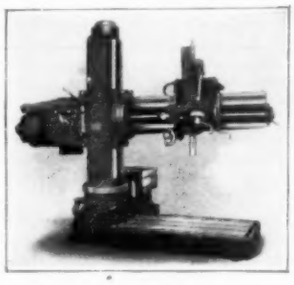
Patented Aug. 20, 1918

Drilling Machine, Radial, 4-Ft.
Scott Brothers, Ltd., Halifax, England.
"American Machinist," (English Edition), June 12, 1920



The chain drive is by 5-hp. electric motor. Gear box gives 6 speeds operated by two levers, which in combination with the double gears, give 12 spindle speeds from 30 to 420 r.p.m. Spindle has ball thrust washers, the arm also revolving on ball bearings. The 3 gear-driven feeds are 145, 97, and 64 cuts per inch; they are engaged by friction clutch. Cross handle at top of pillar allows for an arm elevation of 7 in. The pillar is 8¼ in. in diameter. Spindle is 2¼ in. in diameter in the driving part and has a traverse of 14 in.; it is bored out No. 4 Morse taper. The maximum height from spindle nose to table is 24 in. Top surface of the T-slotted worktable is 43 x 22 in. Approximate weight, 1,350 lb.

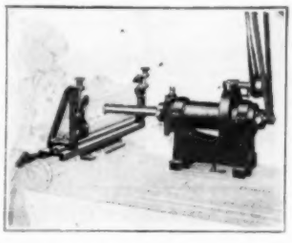
Drilling Machine, "Right-Line" Radial
Niles-Bement-Pond Co., 111 Broadway, New York City.
"American Machinist," July 1, 1920



A noteworthy feature is embodied in the design of column. All controls operated from the head, and the column clamp is electrically operated. The base of machine has an extension which carries a table back of the column and at a right angle to the main working surface.

Specifications: Distance under spindle to base: minimum, 12 in.; maximum, 68 in. Base: working surface, 5 ft. 11 in. x 3 ft. 6 in. Table: top, 23 x 27 in.; height, 30 in. Spindle traverse, 18 in. Feeds: number, 8; amount, 0.006 to 0.06 in. per rev. Hp. of driving motor, 10. Spindle speeds: number, 28; amount, 20 to 400 r.p.m. Height, 11 ft. 6 in. Diameter of floor space required, 15 ft. 5 in.

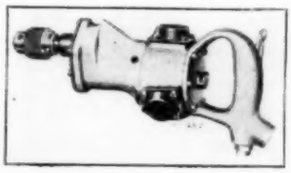
Grinding Machine, Cylinder Boring and
Sunderland Machine Shop, Omaha, Neb.
"American Machinist," July 1, 1920



The attachment is intended for garage and repair-shop work and it is designed to fit a standard lathe, being independent of the lathe-headstock. The base of the grinding head can be adjusted to suit different distances between the lathe Vs. The table upon which the cylinder blocks rest is fastened to carriage of lathe. The brackets can be adjusted to hold cylinder blocks of various sizes, and a micrometer cross-feed is provided for bringing different cylinders into alignment with the spindle.

Specifications: Size; to fit lathes of 14- to 24-in. swing; to hold blocks of 1 to 6 cylinders; to bore and grind cylinders of 2½ in. diameter and larger. Swing; over ways, 22 in. Length of spindle, 15½ in. Weight, boxed, 500 lb.

Drills, "Little David" Nos. 6 and 600 Pneumatic
Ingersoll-Rand Co., 11 Broadway, New York City.
"American Machinist," July 1, 1920



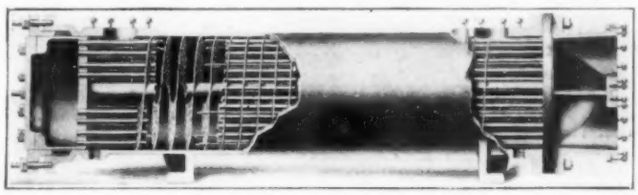
The Nos. 6 and 600 drills are intended for twist drills up to ⅝ in. diameter. The free speed at 90 lb. air pressure is about 2,000 r.p.m. The two machines differ only in handle construction, the motors being the same. No. 6 has the pistol-grip handle, while No. 600 is furnished with breast plate and rolling throttle handle. Aluminum reinforced with steel bushings is used wherever possible to reduce weight, the No. 6 weighing only 9 lb. The motor is of the three-cylinder type, and the cylinders are separate iron castings, easily accessible, renewable and interchangeable. The bearings are all either ball or roller type.

Table, Drilling Duplex Universal
Machinery and Engineering Equipment Co., Bradford, Englahd.
"American Machinist," (English Edition), June 12, 1920

Large range is obtained by having revolving member on top of tilting member instead of at the base. Circular table is 12 in. in diameter and has three planed T-slots. It is graduated in degrees and can be secured in any position by two bolts. The auxiliary T-slotted rectangular table at a right angle to circular table is 18 in. long by 12 in. wide; it is intended for handling work of larger dimensions, where an extensive range of angles is unnecessary. The tilting member is adjusted to any desired angle through worm gear and handle. The tube on which it revolves is of large diameter and is graduated in degrees. The complete table 18 in. long, 14 in. wide and 14 in. deep overall. Weight, 500 lb.

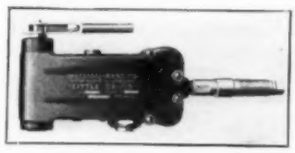
Cooler, "Multiwhirl" Oil
Griscom-Russell Co., 90 West St., New York City.
"American Machinist," July 1, 1920

Designed for cooling oil used in lubrication of turbine bearings and reduction gears, or quenching oil in the heat treating of steel. The oil is constantly circulated through the cooler, and kept at



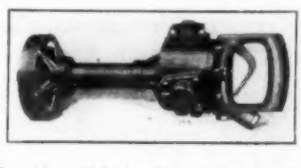
a constant temperature permitting both the continued use of the original quantity of oil and its maintenance at the proper viscosity for efficient results. The whirling path of the oil is accomplished by the use of a helical baffle, which directs the oil in its flow.

Drill, "Little David" No. 8 Pneumatic
Ingersoll-Rand Co., 11 Broadway, New York City.
"American Machinist," July 1, 1920



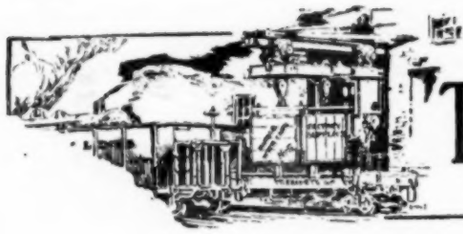
The No. 8 close-quarter drill is a machine for use close to a wall or corner. This machine runs at 250 r.p.m. without load, and will handle drilling, reaming or tapping up to 1½ in. diameter. The spindle which turns the drill is operated by three rocking levers connected directly to the pistons through connecting rods. The motor is of the three-cylinder type with pistons acting at right angles to the levers.

Grinders, "Little David" Nos. 601 and 602 Pneumatic
Ingersoll-Rand Co., 11 Broadway, New York City.
"American Machinist," July 1, 1920



The Nos. 601 and 602 grinders are light-weight tools, running with a free speed of 4,200 r.p.m., and are suitable for grinding, buffing or polishing work. Both machines have the same type of motor but are equipped with different throttles and handles, the 601 having the closed type of inside trigger handle, while the No. 602 is fitted with the rolling types of throttle handle. The three-cylinder motor runs in a bath of oil. The valve is integral with the crankshaft, and ball and roller bearings are used throughout. The removal of a few screws enables the handle to be lifted off exposing the entire mechanism to view.

Clip, paste on 3 x 5-in. cards and file as desired



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

	Current	One Year Ago
CINCINNATI		
No. 2 Southern	$45.60	$29.80
Northern Basic	42.80	27.55
Southern Ohio No. 2	46.80	28.55
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	49.65	31.90
Southern No. 2 (Silicon 2.25 to 2.75)	49.70	33.95
BIRMINGHAM		
No. 2 Foundry	42.00@44.00	25.75
PHILADELPHIA		
Eastern Pa., No. 2x, 2.25-2.75 sil.	46@48.25*	30.65
Virginia No. 2	45.00*	30.85
Basic	44.50†	29.90
Grey Forge	43.50*	29.90
CHICAGO		
No. 2 Foundry local	44.25	27.25
No. 2 Foundry, Southern	47.00	31.75
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	45.65	28.15
Basic	44.40	27.15
Bessemer	44.90	29.35
MONTREAL		
Silicon 2.25 to 2.75%	43.25	.....

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$4.47	$3.97	$3.47	$5.50	$3.37	$3.97	$3.47
Soft steel bars	4.62	4.12	3.37	5.00	3.27	3.87	3.37
Soft steel bar shapes	4.62	4.12	3.37	.....	3.27	3.87	3.37
Soft steel bands	5.82	5.32	4.07	6.25	.....	.....	.....
Plates, ¼ to 1 in. thick	4.67	4.17	3.67	5.00	3.57	4.17	3.67

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$4.25	$2.75
Warehouse, New York	4.57	3.37
Warehouse, Cleveland	3.52	3.22
Warehouse, Chicago	3.75	3.37

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

	Large Mill Lots	New York			
Blue Annealed	Pittsburgh	Current	One Year Ago	Cleveland	Chicago
No. 10	3.55-6.00	7.12@8.00	4.57	7.55	7.02
No. 12	3.60-6.05	7.17@8.05	4.62	7.65	7.07
No. 14	3.65-6.10	7.22@8.10	4.67	7.70	7.12
No. 16	3.75-6.20	7.32@8.20	4.77	7.80	7.22
Black					
Nos. 18 and 20	4.15-6.30	8.50@9.50	5.17	8.20	7.80
Nos. 22 and 24	4.20-6.35	8.55@9.55	5.22	8.25	7.85
No. 26	4.25-6.40	8.60@9.60	5.27	8.30	7.90
No. 28	4.35-6.50	8.70@9.70	5.37	8.40	8.00
Galvanized					
No. 10	4.70-7.50	9.75@11.00	5.50	8.50	8.15
No. 12	4.80-7.60	9.85@11.00	5.55	8.60	8.20
No. 14	4.80-7.60	9.85@11.10	5.60	8.60	8.35
Nos. 18 and 20	5.10-7.90	10.10@11.40	5.90	8.90	8.65
Nos. 22 and 24	5.25-8.02	10.25@11.55	6.05	9.05	9.05
No. 26	5.40-8.20	10.40@11.70	6.20	9.20	9.20
No. 28	5.70-8.50	10.70@12.00	6.50	9.50	9.50

Acute scarcity in sheets, particularly black, galvanized and No. 16 blue enameled.

Automobile sheets are unavailable except in fugitive instances, when prices are 9.45c per lb. for No. 16; 9.50 for Nos. 18 and 20, and 9.55c for Nos. 22 and 24.

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$6.25	$5.80	$6.00
Flats, square and hexagons, per 100 lb. base	6.75	6.30	6.50

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	50
Cleveland	50
Chicago	50

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots is:

	Current	One Year Ago
New York	$20.00	$25.50–30.00
Cleveland	20.00	20.00
Chicago	21.00	16.50

In coils an advance of 50c. usually is charged.
Domestic iron (Swedish analysis) is selling at 12c. per lb.

WELDING MATERIAL (SWEDISH)—These prices are the best we have been able to obtain for Swedish welding materials, of which it is reported that very little are on the market.

Welding Wire		Cast-Iron Welding Rods	
5/32, 11/64, 3/16, 1/4, 5/16, 3/8	21.00 to 30.00	3/16 by 12 in. long	14.00
No. 8, 3/32 and No. 10		1/4 by 19 in. long	12.00
1/8		5/16 by 19 in. long	10.00
No. 12		3/8 by 21 in. long	10.00
5/32, No. 14 and 1/16		Special Welding Wire, Coated	
No. 18		1/8	33.00
No. 20		5/32	30.00

Domestic—Welding wire in 100-lb. lots sells as follows, f. o. b. New York: 5/32, 8½c. per lb.; 1/8, 8c.; 3/16 to 1/4, 7½c.

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	7.00	8.00	9.00
Spring steel (light)	10.00	11.00	12.25
Coppered bessemer rods	9.00	8.00	6.75
Hoop steel	6.07	6.50	5.32
Cold-rolled strip steel	12.50	8.25	10.75
Floor plates	6.80	6.00	6.77

PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card, discounts on steel pipe, applying as from January 14, 1920, and on iron pipe from January 7, 1920.

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
BUTT WELD					
⅛, ¼ and ⅜	47%	20½%	¾ to 1¼	34½%	18½%
½	51%	36½%			
¾ to 3	54%	41½%			
LAP WELD					
2	47%	34½%	2	28½%	14½%
2½ to 6	50%	37½%	2½ to 6	30½%	17½%
BUTT WELD, EXTRA STRONG PLAIN ENDS					
⅛, ¼ and ⅜	43%	25½%	¾ to ¼	34½%	19½%
½	48%	35½%			
¾ to 1¼	52%	39½%			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	45%	33½%	2	29½%	16½%
2½ to 4	48%	36½%	2½ to 4	31½%	19½%
4½ to 6	47%	35½%	4½ to 6	30½%	18½%

Stock discounts in cities named are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
⅛ to 3 in. steel butt welded	40%	24%	40%	31%	54@40%	40½@30%
2½ to 6 in. steel lap welded	35%	20%	42%	27%	50@40%	37½@27½%

Malleable fittings. Class B and C, banded, from New York stock sell at plus 32%. Cast iron, standard sizes, net.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	Month Ago	Year Ago
Copper, electrolytic	18@19	19.25	19.75
Tin in 5-ton lots	48.00	61.50	70.50
Lead	8.00	9.00	5.40
Spelter	7.75	8.70	7.50
ST. LOUIS			
Lead	7.75	8.87½	5.15
Spelter	7.50	8.37½	7.15

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

	New York			Cleveland		Chicago April 8	
	Current	Month Ago	Year Ago	Current	Year Ago	Current	Year Ago
Copper sheets, base	33.50	33.50	27.50	32.00	28@30	36.00	27.00
Copper wire (carload lots)	31.25	31.25	24.00	29.50	26.50	27.00	23.00
Brass sheets	28.50	28.50	23.00	29.00	27.00	27.00	21.50
Brass pipe	33.00	33.00	34.00	34.00	35.00	35.00	31.00
Solder (half and half) (case lots)	33.00	33.00	45.00	40.50	41.00	38.00	39.00

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill. 100 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	23.75	19.00
New York	25.00	21.50
Cleveland	27.00	24.00
Chicago	26.00	24.90

SHOP MATERIALS AND SUPPLIES

ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f.o.b. mill..... 12.00

	—In Casks—		— Broken Lots —	
	Current	One Year Ago	Current	One Year Ago
Cleveland	15.00	12.95	15.50	13.30
New York	14.00	12.00	14.50	13.00
Chicago	15.00	16.50	15.00	16.00

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	7.50@7.75	8.37½
Chicago	9.50	10.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	— New York —			
	Current	One Year Ago	Cleveland	Chicago
Copper, heavy, and crucible	16.00	16.50	16.50	16.50
Copper, heavy, and wire	15.25	15.25	16.50	15.00
Copper, light, and bottoms	13.75	13.25	15.00	14.00
Lead, heavy	7.00	4.62½	7.00	7.00
Lead, tea	5.00	3.75	5.00	6.00
Brass, heavy	10.25	9.75	12.50	16.50
Brass, light	7.50	7.75	10.00	9.50
No. 1 yellow brass turnings	8.50	8.75	10.00	10.00
Zinc	5.25	4.25	5.00	5.50

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	33.00	34.00c.@35.00c.	33.50

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	38.00	25.00
Chicago	29.00	28.00
Cleveland	32.00	28.50

BABBITT METAL—Warehouse price per pound:

	—New York—		—Cleveland—		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	90.00	87.00	74.50	79.00	60.00	75.00
Commercial	50.00	42.00	21.50	17.50	15.00	15.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	— New York —		— Cleveland —		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	+$4.00	1.28	$ .75	$1.90	$.50	2.00
Hot pressed hexagon	+ 4.00	.85	.75	1.90	.50	2.00
Cold punched hexagon	+ 4.00	3.25	.75	1.90	.50	1.30
Cold punched square	+ 4.00	2.70	.75	1.90	.50	1.30

Semi-finished nuts, ⅜ and smaller, sell at the following discounts from list price:

	Current	One Year Ago
New York	30%	50-10%
Chicago	50%	50%
Cleveland	50%	60-10-10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	List	20%	20%
Larger and longer up to 1½ in. by 30 in.	+20%	20%	10%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York..... list Cleveland..... $3.00 Chicago..... $3.00

For cast-iron washers, ½ and larger, the base price per 100 lb. is as follows:

New York..... $7.00 Cleveland..... $4.50 Chicago..... $4.75

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	10%	15%	10%
Larger and longer up to 1 in. by 30 in.	10%	10%	5%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	— Rivets —		— Burs —	
	Current	One Year Ago	Current	One Year Ago
Cleveland	20%	25%	10%	10%
Chicago	net	10%	net	10%
New York	25%	40%	net	20%

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅞ and smaller	30%	30%	30%
Tinned	30%	30%	30%

Boiler, ½, ⅝, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:

New York..... $6.00 Chicago..... $5.62 Pittsburgh..... $4.72

Structural, same sizes:

New York..... $7.10 Chicago..... $5.72 Pittsburgh..... $4.82

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	34.00	34.00	35.00
Brass	33.00	34.00	34.00

For immediate stock shipment 3c. is usually added. The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb. advance is 5c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb. 10c. should be added to base price; quantities from 10-25 lb., extra is 25c.; less than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ½-2 in. inclusive in rounds, and ½-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

LONG TERNE PLATE—In Chicago No. 28 primes from stock sell, nominally, for $12.50 per 100 lbs.

COTTON WASTE—The following prices are in cents per pound:

	— New York —			
	Current	One Year Ago	Cleveland	Chicago
White	11.00@15.50	13.00	16.00	11.00 to 14.00
Colored mixed	7.00@10.50	9.00-12.00	12.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x20½
Cleveland	55.00	65.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.00	$3.00	$1.75
Philadelphia	2.75	2.75	1.75
Cleveland	2.50	2.50	2.75
Chicago	2.25	2.50	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.90	$3.90	$3.65
Philadelphia	3.65	3.65	3.62
Chicago	5.00	5.00	4.12½

COKE—The following are prices per net ton at ovens, Connellsville:

	July 8	July 1	June 24
Prompt furnace	$17.50@$18.50	$17.50@$18.50	$15.00@$16.00
Prompt foundry	18.00@19.00	18.00@19.00	16.00@17.00

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	100-lb. bag	1.00

LINSEED OIL—These prices are per gallon:

	— New York —		— Chicago —	
	Current	One Year Ago	Current	One Year Ago
Raw in barrels (5 bbl. lots)	$1.58	$1.15	$2.02	$2.27
5-gal. cans (without cans)	1.60*	2.28	2.27	2.47

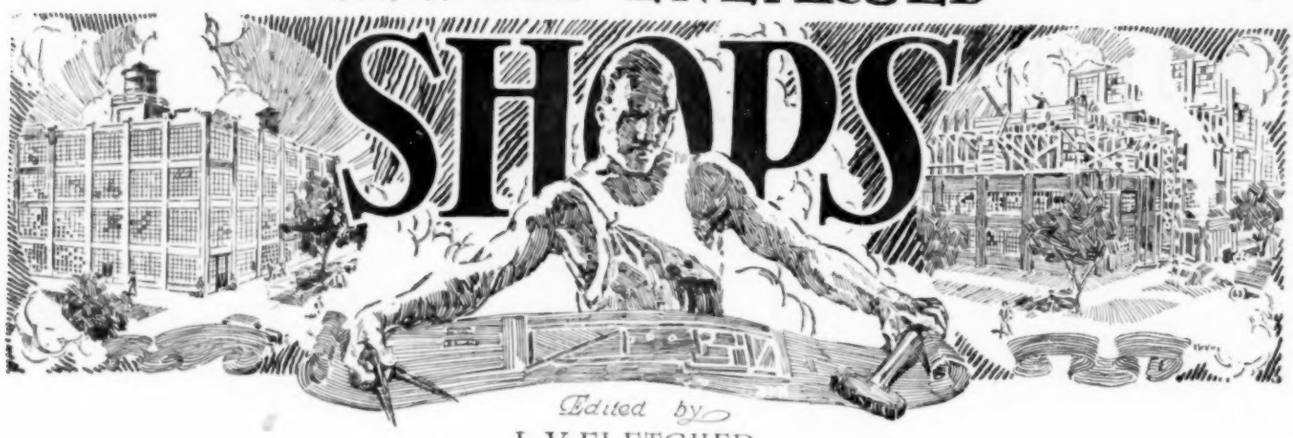
*To this *oil* price must be added the cost of the cans (returnable), which is $2.25 for a case of six.

WHITE AND RED LEAD—Base price per pound:

	— Red —				— White —	
	Current		One Year Ago		Current	One Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100 lb. keg	15.50	17.00	13.00	14.50	15.50	13.00
25 and 50-lb. kegs	15.75	17.25	13.25	14.75	15.75	13.25
12½-lb. keg	16.00	17.50	13.50	15.00	16.00	13.50
5-lb. cans	18.50	20.00	15.00	16.50	18.50	15.00
1-lb. cans	20.50	22.00	16.00	17.50	20.50	16.00

500 lb. lots less 10% discount. 2000 lb. lots less 10-2½% discount.

NEW and ENLARGED



Edited by
L·V·FLETCHER

Machine Tools

The following concerns are in the market for machine tools:

Conn., Bridgeport—W. Levin, 108 Reilly St.—automobile repair tools.

Mass., Boston — The Colonial Motors Corp.—miscellaneous machine tool equipment.

Mass., Greenfield — The Wells Special Mchy. Co.—low swing lathes, planers, turning lathes, cylindrical grinders and duplex milling machines.

Md., Baltimore—F. Molnaur, 531 South Ann St.—garage equipment.

Md., Sparrows Point — The Bethlehem Steel Co.—one universal and tool grinding machine with automatic feed table, B. & S. No. 13.

N. Y., Goshen—The I. H. Dexter Co., Inc. —one 40 to 50 in. x 10 or 12 ft. planing machine with 1 or 2 heads on rail and one 2½ or 3 ft. radial drill press (used).

N. Y., New York (Borough of Brooklyn) —The Intertype Corp., 50 Court St.—screw machines, lathes and other machine tools.

N. Y., New York (Borough of Manhattan) —F. T. Craven, 50 Church St.—one 500 ton and one 1,000 ton press.

N. Y., New York (Borough of Manhattan) —The Groton Iron Wks., 50 Bway.—two gate shears of ¼ in. capacity.

N. Y., New York (Borbugh of Manhattan) —The Holtrans Co., 154 Nassau St.—screw machine for use in Japan.

N. Y., New York (Borough of Manhattan) —Mayer & Lage, 120 Bway.—machine tools for export to Japan.

N. Y., Salem—The Humphrey Die and Tool Corp.—shapers, surface grinders and toolroom lathes.

N. Y., Schenectady—The General Electric Co., River Rd., A. R. Howgate, Purch. Agt.—several presses for Bridgeport, Conn., plant.

N. Y., West Albany—The New York Central R.R.—one cold saw, two turret lathes and one link grinder.

N. Y., Whitehall — The Champlain Silk Mills—one milling machine with 58 in. table traverse, and one 30 to 36 in. radial drill.

Pa., Allentown—W. H. Taylor & Co.—one 28 in. drill press with No. 4 shaper in spindle.

Pa., Chester — The Chester Shipbuilding Co.—two No. 3 Avey drills, capacity 1¼ in., and highspeed drills complete with lubricant tank, motor driven.

Pa., Philadelphia — The Ace Motorcycle Co.—automatic screw machines and milling machines.

Pa., Philadelphia—The Pennsylvania Ry., Bell Bldg.—one turret lathe, similar to No. 2A, Warner & Swasey, arranged for 220 v., d.c.

Pa., Philadelphia — The Taylor Wharton Iron and Steel Co., 25th and Washington Sts.—machine shop equipment.

Pa., Wilkes-Barre — The Lehigh and Wilkes-Barre Coal Co., Lehigh and Wilkes-Barre Blk.—miscellaneous machine tools.

La., Shreveport — The International Gas and Oil Corp.—one 2½ to 6 or 8 in. pipe cutting machine, belt driven, with or without steam engine (used).

N. C., Raleigh — The Garage Equipment Co., 809 Citizens' Bank Bldg., E. L. Moffett, Sales Mgr.—
One small vertical spindle milling machine.
One light hack saw, about 4 in. jaw.
One 24 or 28 in. upright drill press.
One 21 or 24 in. lathe with short bed.
One plain screw machine for 1 1/16 in. stock.

Ill., Chicago—The Ajax Forge Co., 2503 Blue Island Ave.—
One trimming press with side shear for 2,000 lb. steam drop hammer.
One 2,000 lb. steam drop hammer.
One 3,000 lb. steam drop hammer.
One 10 ton crane with 76 ft. span.
One 5 or 10 ton crane with 35 to 50 ft. span.
One 2 ton crane with 28 ft. span, hand operated.
One guillotine shear, capacity 3 in. rounds.
One belt driven air compressor, 500 ft. per minute, 125 lb. pressure.

Ill., Chicago—The Convex Sign Co., 162 Austin Ave.—one 16 in. x 8 ft. engine lathe.

Ill., Chicago—The Chicago, Burlington & Quincy Ry., 547 West Jackson Blvd. — chucks, as follows—
Six 15 in., iron scroll combinations.
Six 15 in., steel geared, scroll combination.
One 10½ in., iron scroll combination.
One 10½ in., steel geared scroll combination.
One 18 in., iron scroll combination.
One 18 in., steel geared scroll combination.
One 18 in., iron geared scroll combination.
Two 24 in., 4 jaw, iron independent.
Two 24 in., 4 jaw, steel independent.
One 4 in., screw type with reversible jaws.
One 18 in., 4 jaw, iron independent.
One 18 in., 4 jaw, steel independent.
Two 14 in., 4 jaw, iron independent.
Two 14 in., 4 jaw, steel independent.
One 16 in., 4 jaw, iron independent.
One 16 in., 4 jaw, steel independent.
Four 15 in., 2 jaw, round body with slip jaws.

Ill., Chicago—The Federal Metal Weather Strip Co., 1242 Fullerton Ave.—
One No. 2, one No. 3 and and one No. 4 belt driven punch press, 2½ to 4 in. stroke.
One 1,500 lb., one 1,000 lb., and one 500 lb. board drop hammer.
One 200 lb. Bradley hammer.

Ill., Chicago—H. Wissmiller, 932 Montana St.—one double spindle shaper.

Ill., Springfield—The United Supply Co.—one double action cam drawing press with stroke 5 in. or more, Bliss 69 N or similar.

Mich., Detroit — The Hayes Mchy. Co., East Larned St., A. Sprague, Purch. Agt. —large and medium sized press (used preferred).

O., Cleveland—The Bd. Educ., East 6th St. and Rockwell Ave.—manual training equipment including lathes, saws, work benches, etc.

Wis., Beloit—C. H. Besly & Co.—eight 14 in. x 6 ft. engine lathes with taper attachment.

Wis., Milwaukee—The Lisbon Ave. Motor Co., 508 54th St., A. Freiburger, Purch. Agt.—one lathe, one drill press and machinery for tire repair.

Wis., West Allis—The Warner Machine Co., 7521 Scott St., F. Gardner, Purch. Agt. —one 14 to 20 in. shaper and one heavy duty grinder.

Mo., Kansas City—The W. S. Dickey Clay Mfg. Co., New York Life Bldg.—
Four 25 x 50 in., 14 ft. gap lathes.
Two 28 or 30 in. drill presses.
Two 50 lb. power hammers.
One 10 in. high speed bench drill.
Two 2 in. bolt threading machines.
One pneumatic drill up to 2 in.
One 2½ ft. radial drill.
Three 24 in. shaping machines.
Two 20 in. x 12 ft. engine lathes.
One 24 in. x 24 in. x 8 ft. planing machine.
One 14 in. double wheel emery grinder.
One No. 2 draw cut back saw machine.
One 6 in. combination bench vise.
One 8 in. combination bench vise.

Tex., Corsicana—The Corsicana Grader and Machine Co., C. E. Kerr, Purch. Agt.— complete machine tool equipment including drill presses, lathes and trip hammer.

Machinery

The following concerns are in the market for machinery:

Md., Baltimore—The Miller Safe Co., Fremont Ave. and Briscoe St.—equipment for the manufacture of safes.

N. Y., Buffalo—The Parenti Motors Corp., 1754 Main St.—wood and metal working equipment for manufacture of automobiles.

N. Y., New York (Borough of Manhattan) —The Cunard Terminal Co., 24 State St.— one electric traveling crane for Weehawken terminal.

Pa., Philadelphia — The Chestnut Hill Hospital, 8815 Germantown St. — laundry equipment.

Va., Richmond — The Virginia Carolina Chemical Co., 12th St., J. Maxwell, Purch. Agt.—traveling cranes.

W. Va., Parkersburg—The Baldwin Tool Wks.—electric cranes.

Mich., Detroit—The Federal Bearing and Bushing Corp., 362 Trombly Ave.—miscellaneous equipment for manufacture and finishing of bearings and bushings for automobiles.

Mich., Detroit—The Michigan Grey Iron Castings Co., Harbaugh Ave. and Wabash Ry.—miscellaneous foundry equipment.

O., Cleveland—The Biggs Watterson Co., 1235 West 9th St.—one 12 in. pipe cleaning machine.

Wis., Milwaukee—The Cortsa Motors Co., 663 37th St., C. R. Kurtze, Purch. Agt.— machinery for manufacture of automobiles.

Wis., Milwaukee—R. Jeske & Bro. Co., 111 Reservoir Ave.—sheet metal working machinery.

Wis., Milwaukee—The Patton Paint Co., 213 Lake St.—special equipment for manufacture of varnish.

Wis., Milwaukee — The Tire Shop, 481 13th St.—complete vulcanizing outfit.

Wis., Oshkosh—The Three C Davenport Co., 33 Main St., O. Konrad, Purch. Agt.— woodworking machinery.

Wis., Racine—The Hamilton Beach Mfg. Co., Rapids Drive—foundry equipment.

Wis., Waukesha—The Waukesha Casting Co.—foundry equipment.

Mo., St. Louis—The Missouri Pacific Ry., Ry. Exch. Bldg., C. A. Howe, Purch. Agt.—one sand blast machine for cleaning steel work.

N. B., Doaktown—F. D. Swin—machinery for sawmill.

Ont., Arner—J. Stadden—machinery for sawmill.

Ont., Auburn—B. Marsh—machinery for a sawmill.

Ont., Ottawa—Fraser & Bryson, Ltd.—equipment for Bell River ground wood pulp mill.

Ont., Porcupine—McChesney, Ltd.—sawmill equipment.

Ont., Sudbury — The Continental Wood Products Co.—machinery for sawmill and pulpwood preparing plant.

Ont., Toronto—The Hockon Lumber Co.—planing mill equipment for West River mill.

Ont., Tottenham—McCabe Bros.—32 machines for planing mill.

Que., Brysons—J. Argue—machinery for sawmill.

Que., Nouvelle—A. Filion, Ltd.— equipment for planing and sawmill.

Metal Working

NEW ENGLAND STATES

Conn., Bridgeport — The General Motors Service and Truck Co., 554 Fairfield Ave., has awarded the contract for the construction of a 1 story, 110 x 120 ft. service station on Holland Ave. Estimated cost, $75,000.

Conn., Bridgeport—W. Levin, 108 Reilly St., will soon award the contract for the construction of a 1 story, 50 x 60 ft. garage on Pembroke St. Estimated cost, $15,000. H. E. Koerner, 164 State St., Archt.

Conn., Hartford—M. W. DeLaney, 77 Greenfield St., will soon award the contract for the construction of a 1 story, 55 x 110 ft. garage on High St. Estimated cost, $25,000. F. Walz, 407 Trumbull St., Archt.

Conn., Hartford—J. Ferringo, 174 Barbour St., will build a 1 story, 45 x 96 ft. garage. Estimated cost, $15,000.

Conn., Hartford—M. Lefsitz, 38 Kennedy St., will soon award the contract for the construction of a 1 story, 35 x 85 ft. garage on Arthur Pl. Estimated cost, $10,000.

Conn., Hartford—The A. F. Way Co., Inc., 32 Union Pl., is building a factory for the manufacture of special machinery. Estimated cost, $35,000.

Conn., South Manchester—Cheney Bros., Hartford Rd., manufacturers of silk, have awarded the contract for the construction of a 1 story, 30 x 80 ft. toolroom addition at their plant.

Mass., Brookline — D. Cerussi, 15 Exchange St., Boston, has awarded the contract for the construction of a 2 story, 100 x 270 ft. garage and salesroom on Commonwealth Ave. and St. Paul St., here. Estimated cost, $200,000.

Mass., Dorchester (Boston P. O.)—The Byrne Realty Co., 435 Geneva Ave., is having plans prepared by M. H. Maney, Archt., 16 Paisley Park, for the construction of a 1 story, 95 x 165 ft. garage on Holmes Ave. Estimated cost, $50,000.

Mass., Springfield — The Westinghouse Electric and Mfg. Co., Page Blvd., will build a 1 story, 125 x 160 ft. foundry. Estimated cost, $35,000.

Mass., Worcester — M. N. Ullman, 50 Water St., will build a 1 story, 80 x 95 ft. garage on School St. Estimated cost, $50,000.

N. H., Manchester—The Leighton Machine Co. is building a factory with 20,000 sq.ft. of floor space for the manufacture of knitting machines. Estimated cost, $40,000.

N. H., Nashua—Mercer Bros., 280 Main St., will soon award the contract for the construction of a 1 story garage. Estimated cost, $50,000. Hutchinson & French, 6 Beacon St., Boston, Archts.

Vt., Bennington—The Standard Oil Co. of New York, 26 Bway., New York City, has awarded the contract for the construction of a 1 story, 23 x 60 ft. garage and 12 x 18 ft. pumphouse, here. Estimated cost, $25,000.

Vt., Burlington—The Standard Oil Co. of New York, 26 Bway., New York City, has awarded the contract for the construction of a 1 story, 45 x 52 ft. garage, here. Estimated cost, $25,000.

MIDDLE ATLANTIC STATES

Md., Baltimore—W. C. Hipple, North Ave. and Chester St., will soon award the contract for the construction of a 1 story, 80 x 100 ft. addition to his garage. Estimated cost, $30,000.

Md., Baltimore — The Miller Safe Co., Fremont Ave. and Briscoe St., will soon award the contract for the construction of a 1 and 2 story, 123 x 400 ft. factory on Wilkens Ave. and Catherine St. Estimated cost, $350,000. Noted July 8.

Md., Baltimore—F. Molnaur, 531 South Ann St., will build a 1 story, 42 x 96 ft. garage. Estimated cost, $12,000.

Md., Baltimore—The Steinmetz Electric Motor Car Co., Inc., has acquired the 1 story, 100 x 240 ft. plant of Reus Bros. Co., on Kate Ave. along the tracks of the Western Maryland R.R., and plans to enlarge same and construct several other buildings.

N. J., Trenton—The Amer. Bridge Co., South Warren St., will build a 1 story, 79 x 200 ft. and 32 x 122 ft. addition to its plant. Estimated cost, $65,000.

N. Y., Geneva—The Standard Oil Co. of New York, 26 Bway., New York City, has awarded the contract for the construction of a 1 story, 25 x 60 ft. garage, here. Estimated cost, $20,000.

N. Y., Honeoye Falls—The Standard Oil Co. of New York, 26 Bway., New York City, has awarded the contract for the construction of a 2 story, 35 x 66 ft. garage, here. Estimated cost, $30,000.

N. Y., Macedon—The Standard Oil Co. of New York, 26 Bway., New York City, has awarded the contract for the construction of a 1 story, 33 x 55 ft. garage, here. Estimated cost, $30,000.

N. Y., New York (Borough of Brooklyn)—Havemeyer & Elder, c/o S. Millman, Archt., 26 Court St., will build a 1 story, 100 x 150 ft. garage on Atlantic Ave. and Elton St. Estimated cost, $35,000.

N. Y., New York (Borough of Brooklyn)—The M.C.K. Constr. Co., 2336 Fulton St., will build a 1 story, 80 x 150 ft. garage on Hancock St. and Cypress Ave. Estimated cost, $30,000.

N. Y., New York (Borough of Brooklyn)—M. Seidman, 1463 St. Marks Ave., will building a 1 story, 50 x 100 ft. garage on Amboy St. near Pitkin Ave. Estimated cost, $35,000.

N. Y., New York (Borough of Brooklyn)—H. Strongin, 1705 Pitkin Ave., will build a 1 story, 120 x 130 ft. garage on Coney Island Ave. near Cortelyou Rd. Estimated cost, $20,000.

N. Y., New York (Borough of Manhattan)—M. O'Dowd, Inc., c/o J. S. Maher, Archt., 431 West 14th St., will build a 3 story, 100 x 125 ft. garage at 56 North 23rd St. Estimated cost, $100,000.

N. Y., Nunda—The Standard Oil Co. of New York, 26 Bway., New York City, has awarded the contract for the construction of a 2 story, 42 x 45 ft. garage, here. Estimated cost, $40,000.

N. Y., Oneida—The Standard Oil Co. of New York, 26 Bway., New York City, has awarded the contract for the construction of a 23 x 60 ft. garage, 15 x 20 ft. boiler house, and 12 x 16 ft. pumphouse, here, each 1 story. Estimated cost, $35,000.

N. Y., Sherman—The Standard Oil Co. of New York, 26 Bway., New York City, has awarded the contract for the construction of a 2 story, 25 x 32 ft. garage here. Estimated cost, $20,000.

N. Y., Silver Springs—The Standard Oil Co. of New York, 26 Bway., New York City, has awarded the contract for the construction of a 2 story, 35 x 62 ft. garage, here. Estimated cost, $25,000.

Pa., Philadelphia—The Diesinger Motors Co., 1827 Chestnut St., has awarded the contract for the construction of a 2 story, 70 x 120 ft. sales and service building on 22nd and Chestnut Sts.

Pa., Philadelphia — The Lowry Top and Body Co., Gaul and Adams Sts., has awarded the contract for altering its factory. Estimated cost, $25,000.

Pa., Philadelphia—M. Wenger, 250 South Camac St., has awarded the contract for the construction of a 2 story, 50 x 110 ft. addition to his garage. Estimated cost, $15,000.

SOUTHERN STATES

Ky., Vine Grove—The Service Garage Co. is building a 50 x 125 ft. garage. Estimated cost, $14,000.

MIDDLE WEST

Ind., Ft. Wayne—The General Electric Co., Bway. and Pennsylvania Ry., is building a 2 and 3 story, 150 x 300 ft. lamp factory on Winter St. Estimated cost, $400,000.

Ind., Ft. Wayne—The International Harvester Co. of America, 606 South Michigan Ave., Chicago, has purchased a 140 acre site east of here, and plans to build a plant for the manufacture and assembly of motor trucks. The first unit will cover 12 acres and will include a number of 1 story buildings, also a 3 story L-shaped building to house the carpenter shops and shipping department. The ultimate development of the plant as planned will extend over a period of 3 years and cost about $4,000,000.

Mich., Ann Arbor — The Amer. Broach and Machine Co. is building a 50 x 250 ft. plant for the manufacture of broaching machines.

Mich., Grand Rapids—The Amer. Can Co., 120 Bway., New York City, will soon award the contract for the construction of a factory on 6th St., here. Estimated cost, $1,000,000. M. M. Loony, 120 Bway., New York City, Archt. and Engr.

Mich., Kalamazoo—The State Bd. Educ. will soon award the contract for the construction of a 2 story, 96 x 250 ft. manual arts building on Oakland Drive, to include a foundry and auto mechanic and woodworking shops. T. E. Johnson, Secy. H. H. Turner, 923 Michigan Trust Bldg., Grand Rapids, Archt.

O., Akron—The Portage Taxi and Baggage Co., 11 South High St., is having plans prepared for the construction of a 10 story, 66 x 132 ft. business block on South High St., the first floor to be used as a garage. Estimated cost, $200,000.

O., Akron—The S. & O. Engraving Co., 330 South High St., has awarded the contract for the construction of a 2 story, 40 x 150 ft. office and laboratory. Estimated cost, $75,000.

O., Canton — The Schlemmer & Graber Co., 12th St. N. E., has awarded the contract for the construction of a 1 and 2 story, 100 x 250 ft. garage and service building. Estimated cost, $95,000.

O., Canton—Timken Roller Bearing Co., Dueber Ave., will build a 1 story, 120 x 200 ft. factory on Harrison Ave., S.W., for the manufacture of steel. Estimated cost, $40,000.

O., Cincinnati—The Amer. Can Co., 120 Bway., New York City, has awarded the contract for the construction of a plant on Spring Grove Ave. and Fergus St., here, to consist of a 6 story, 72 x 260 ft., 4 story, 60 x 1,400 ft., 1 story, 90 x 97 ft. and 1 story, 80 x 160 ft. buildings. Estimated cost, $1,000,000. Noted April 22.

O., Cleveland—The Bd. Educ., East 6th St. and Rockwell Ave., plans to build a 1 story, 30 room, junior high school on Hopkins Ave., to include a manual training department. Estimated cost, $2,000,000.

O., Cleveland—The Chandler & Price Co., 6000 Carnegie Av., manufacturer of printing machinery, is having plans prepared by H. McGeorge, Archt. and Engr., 6000 Carnegie Ave., for the construction of a 4 story, 42 x 108 ft. factory on Cedar Ave. Estimated cost, $150,000.

O., Cleveland—The Cleveland Belting and Machine Co., 1510 University Rd., has awarded the contract for the construction of a 1 story, 112 x 140 ft. addition to its factory. Estimated cost, $100,000. W. Hartle, Pres.

O., Cleveland — The Hydraulic Pressed Steel Co., 5704 Hydraulic Ave., has awarded the contract for the construction of a 1 story, 75 x 200 ft. addition to its factory. Estimated cost, $75,000.

O., Cleveland—The Ohio Motor Vehicle Co., Nottingham Rd., has awarded the contract for the construction of a 2 story, 50 x 150 ft. factory. Estimated cost, $75,000. C. Rigler, Pres.

O., Cleveland—The Pifer Electric Repair and Mfg. Co., 1392 East 43rd St., has awarded the contract for the construction of a 1 story, 49 x 60 ft. factory. Estimated cost, $25,000.

O., Cleveland—The Superior Screw and Bolt Mfg. Co., 810 Hippodrome Bldg., has awarded the contract for the construction of a 1 story, 130 x 252 ft. factory at 2652 East 93rd St. Estimated cost, $100,000. W. J. Hayes, Treas. Noted July 1.

O., Cleveland—The Union Rolling Mills Co., 8200 Aetna Rd., has had plans prepared by W. Davis, Engr. and Archt., 892 Arcade, for the construction of a 1 story, 22 x 182 ft. addition to its rolling mill. Estimated cost, $30,000.

O., Columbus—The Atlas Brass Fdry Co., 980 South Park St., has awarded the contract for the construction of a 1 story, 80 x 100 ft. brass foundry on Stewart Ave. Estimated cost, $20,000.

O., Lakewood (Cleveland P. O.) — The Hertner Electric Co., 1900 West 112th St., has purchased a site on Elmwood Ave. and plans to build a 1 story, 60 x 250 ft. factory. Estimated cost, $100,000.

O., Massillon—The Lucius Mfg. Co. plans to build a 5 or 6 story, 100 x 200 ft. factory for the manufacture of rivetless steel gas tanks, etc.

Wis., Milwaukee—The City has awarded the contract for the construction of a 1 story, 50 x 120 ft. meter shop on Market St. Estimated cost, $55,000.

Wis., Milwaukee—The Ogden Garage Co., 529 26th Ave., has awarded the contract for the construction of a 1 story, 100 x 160 ft. garage and repair shop on Ogden Ave. Estimated cost, $60,000.

Wis., Racine—The Hamilton Beach Mfg. Co., Rapids Drive., has had plans prepared by A. L. Tlegel, Archt., Baker Blk., for the construction of a 1 story, 80 x 200 ft. foundry. Estimated cost, $60,000.

Wis., Waukesha—The Waukesha Casting Co., formerly F. C. Blair & Son, 340 Bway., is having plans prepared by the C. Kawin Co., Engrs., 431 South Dearborn St., Chicago, for the construction of a 1 story, 120 x 130 ft. foundry. Estimated cost, $50,000.

WEST OF THE MISSISSIPPI

Ark., Little Rock—The Shoemaker Bldg. Co. will soon award the contract for the construction of a 2 story, 140 x 150 ft. garage on Center St. Estimated cost, $175,000. Sanders & Ginocchio, Little Rock, Archts.

CANADA

Ont., Toronto—The Dominion Type Fdry. —equipment for Montreal, Que., plant.

Que., Montreal—The Colonial Wire Mfg. Co., Shearer St., has awarded the contract for the construction of a 3 story factory on St. Patrick St. Estimated cost, $75,000.

Que., Montreal — The Dominion Type Fdry., Ltd., Toronto, has awarded the contract for the construction of a 4 story, 51 x 122 ft. foundry on Hermine St., here. Estimated cost, $135,000.

Que., Montreal—The Sea Sled Co., Ltd., plans to build a plant. Estimated cost, $250,000.

General Manufacturing

NEW ENGLAND STATES

Conn., Bridgeport — The Amer. Specialty Co., 348 George St., has awarded the contract for the construction of a 1 story, 60 x 102 ft. factory, with 50 x 60 ft. ell, on Holland Ave. Estimated cost, $40,000.

Mass., Boston—The W. F. Schraft & Sons Corp., 160 Washington St., is having plans prepared by Haven & Crosby, Engrs. and Archts., 40 Court St., for the construction of a 3 story, 80 x 240 ft. factory on Causeway St., for the manufacture of candy. Estimated cost, $200,000.

Mass., Cambridge—The Presto-Lite Co., Inc., 30 East 42nd St., New York City, will soon award the contract for the construction of a 1 story, 25 x 100 ft. acetylene plant, here. Estimated cost, $80,000. Noted April 15.

Mass., Cambridge—The Revere Sugar Refinery, 15 Broad St., Boston, will soon award the contract for the construction of a 1 story, 90 x 200 ft. cooperage shop on 9th St., here. Estimated cost, $80,000. H. S. Adams, 100 Ames Bldg., Boston, Archt.

Mass., Holyoke—The New England Tire and Rubber Co. has purchased a site with 250 ft. of frontage on Main St. and plans to build a factory for the manufacture of "Holyoke" tires.

Mass., Rockland — The Rockland Webbing Co., Park St., has awarded the contract for the construction of a 2 story, 50 x 175 ft. addition to its factory. Estimated cost, $30,000. Noted June 24.

R. I., Woonsocket—The Alsace Worsted Co., School St., has awarded the contract for the construction of a 1 story, 60 x 140 ft. addition to its factory. Estimated cost, $35,000.

MIDDLE ATLANTIC STATES

N. J., Asbury Park—The Hill Bakery Co., North Stockton St., Trenton, plans to build a bakery on Main St., here. Estimated cost, $150,000.

N. J., Clifton—The Pennsylvania Textile Co., 449 4th Ave., New York City, has awarded the contract for the construction of a plant here. Estimated cost, $200,000.

N. Y., Buffalo—The F. F. Dally Co. of New York, 227 Military Rd., has had plans prepared for the construction of a 1 story, 28 x 127 ft. addition to its plant for the manufacture of blacking. Estimated cost, $6,000.

N. Y., Buffalo—The University of Buffalo, 24 High St., is having plans prepared by McKim, Mead & Wihte, Engrs. and Archts., 101 Park Ave., New York City, for the construction of a 3 story chemical laboratory. Estimated cost, $300,000.

N. Y., New York (Borough of Brooklyn) —The Sheldon Foster Supply Co., c/o L. Allmendinger, Archt. and Engr., 20 Palmetto St., will soon award the contract for the construction of a laundry on DeKalb Ave. Estimatd cost, $200,000.

N. Y., New York (Borough of Manhattan) —The Rigaud Perfume Co., 75 Barrow St., is having plans prepared by Sommerfeld & Steckler, Archts. and Engrs., 31 Union Sq., for the construction of a 7 story, 50 x 50 ft. factory.

N. Y., Syracuse—The Atmospheric Nitrogen Corp., Milton Ave., has awarded the contract for the construction of a 1 story plant on Willis Ave. Estimated cost, $5,00,000. Noted July 1.

Pa., Horrell (Canoe Creek P. O.)—The Standard Powder Co., Philadelphia, will build a 1 story plant here to consist of 25 buildings, including a keg factory. Estimated cost, $1,000,000.

Pa., Jeanette—The Amer. Window Glass Co., Farmers' Bank Bldg., has awarded the contract for the construction of a 1 and 2 story furnace building. Estimated cost, $300,000.

Pa., Oakmont—The Urschel Bates Valve Mfg. Co., 3444 Summit St., Toledo, is building a 4 story factory here. Estimated cost, $250,000.

Pa., Philadelphia — The Chestnut Hill Hospital, 8815 Germantown St., is having plans prepared by Willing & Sims, Archts., 1627 Sansom St., for the construction of a 2 story, 30 x 75 ft. laundry on Chestnut Hill. Estimated cost, $20,000.

Pa., Philadelphia—The Presto-Lite Co., Inc., 30 East 42nd St., will soon award the contract for the construction of a 1 story, 25 x 100 ft. acetylene plant. Estimated cost, $80,000. Noted April 15.

SOUTHERN STATES

Ga., LaGrange—Swift & Co., U. S. Stock Yards, Chicago, has awarded the contract for the construction of a 1 story, 200 x 350 ft. fertilizer plant, here. Estimated cost, including equipment, $250,000.

Ky., Louisville—The Dixie Belle Refining Co., 701 Inter-Saw Bldg., plans to build a refinery on Western Parkway.

Ky., Louisville—The Union Paper Products Co., which has recently been organized with a capital stock of $300,000, has acquired a site on Colapessa, Bernadotte, Alexander and Lowerline Sts., and plans to build a factory for the manufacture of corrugated paper boxes. S. Ohnstein, Pres.

N. C., Charlotte—The Charlotte Spinning Mill Co. is having plans prepared by the Watson Eng. Co., Archts. and Engrs., Hippodrome Bldg., Cleveland, for the construction of a 3 story, 100 x 300 ft. spinning mill and boiler house. Estimated cost, $300,000.

N. C., Hickory—The United Mills Co. has been organized with a capital stock of $500,000, and plans to build a mill for the manufacture of cotton yarn. Estimated cost, $50,000. R. C. Biberstein, Charlotte, Engr.

Va., Richmond—The Baughman Stationery Co., 1320 Broad St., W., is having plans prepared by Carneal & Johnson, Archts. Chamber of Commerce Bldg., for the construction of a 2 story, 173 x 227 ft. factory on Marshal and Graham Sts. Estimated cost, $200,000.

Va., Richmond — The Virginia Carolina Chemical Co., 12th St., has had plans prepared for the construction of a 5 story plant. Estimated cost, $250,000.

W. Va., Martinsburg — The Natl. Shale Brick Co. will soon award the contract for the construction of a plant. Estimated cost, $250,000.

MIDDLE WEST

Ind., Syracuse—The Wawasee Tire and Rubber Co. is having plans prepared by R. L. Simmins, Archt., Elkhart, for the construction of a 3 story, 50 x 175 ft. plant, here.

O., Chagrin Falls—The Adams Bag Co. is having plans prepared by E. McGeorge, Archt. and Engr., 1900 Euclid Ave., Cleveland, for the construction of a 3 story addition to its paper mill. Estimated cost, $100,000.

O., Cleveland—The Mendelsohn Co., 2110 Woodand Ave., manufacturer of cigars, has awarded the contract for remodeling its 3 story, 70 x 100 ft. factory on East 27th St. and Woodand Ave. Estimated cost, $60,000. Noted June 10.

O., Cleveland—The Pavelka Bros., East 37th St. and Bway., dealers in smoked meats, will soon award the contract for the construction of a 2 story, 57 x 65 ft. addition to their factory. Estimated cost, $60,000.

Wis., Milwaukee—The Patton Paint Co., 213 Lake St., will soon award the contract for the construction of a 2 story, 70 x 100 ft. varnish factory and a 2 story, 60 x 112 ft. warehouse.

Wis., Milwaukee—The Carpenter Baking Co., 102 7th St., will soon award the contract for the construction of a 3 story, 35 x 160 ft. addition to its bakery. Noted May 27.

WEST OF THE MISSISSIPPI

Ia., Muscatine — Muscatine Packing Co. has awarded the contract for the construction of a packing plant to include a 5 story, 50 x 100 ft. manufacturing building, 5 story, 100 x 200 ft. cold storage building, 5 story, 70 x 85 ft. abattoir, 4 story, 54 x 64 ft. fertilizer building and 1 story, 50 x 100 ft. power house.

Mo., St. Louis—The Surety Tire and Rubber Co., 2100 Krenlin Ave., plans to build a 1 story, 30 x 175 ft. and 35 x 40 ft. factory. Estimated cost, $40,000.

CANADA

N. B., Doaktown—F. D. Swin is having plans prepared for a saw mill.

Ont., Arner—J. Stadden plans to build an addition to his saw mill.

Ont., Auburn—B. Marsh will build a saw mill.

Ont., Bell River—The Fraser & Bryson Ltd., Ottawa, will soon award the contract for the construction of a ground wood pulp mill, here. Estimated cost, $300,000.

Ont., Porcupine—McCheeney Ltd. will soon award the contract for the construction of a saw mill. Estimated cost, $100,000.

Ont., Sudbury — The Continental Wood Products Co., a subsidiary of the Continental Pulp, Paper and Bag Co., 48 Fermanagh Ave., Toronto, will build a saw mill and plant, here, for the preparation of pulp wood. Estimated cost, $500,000.

Ont., Tillbury—The Tillbury Brick and Tile Co. has awarded the contract for the construction of a 1 story plant, to replace the one which was destroyed by fire. Estimated cost, $30,000.

Ont., Tottenham—McCabe Bros. will soon award the contract for the construction of a planing mill.

Ont., West River—The Hockon Lumber Co., Ltd., Toronto, will build a planing mill here.

Que., Brysons—J. Argue is having plans prepared for a saw mill.

Que., Chelsea—The Royal Securities Co., 164th and James Sts., Montreal, will soon award the contract for the construction of a pulp and paper plant here, for McEdwards & Co., Ottawa.

NEED COMPETENT MEN?
SEE THE SEARCHLIGHT SECTION
Pages 314 to 346 Pages 314 to 346